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FINAL REMEDIAL INVESTIGATION FEASIBILITY STUDY WORK PLAN SITE 41 NAS PENSACOLA FL
10/20/1995
ENSAFE ALLEN AND HOSHALL

**FINAL REMEDIAL INVESTIGATION/
FEASIBILITY STUDY WORK PLAN
FOR SITE 41
NAS PENSACOLA WETLANDS
NAVAL AIR STATION
PENSACOLA, FLORIDA**

**SOUTHNAVFACENGCOM
CONTRACT NUMBER:
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Prepared for:

**Comprehensive Long-Term
Environmental Action Navy (CLEAN)
Naval Support Activity
Naval Air Station
Pensacola, Florida**

Prepared by:

**EnSafe/Allen & Hoshall
5720 Summer Trees Drive, Suite 8
Memphis, Tennessee 38134
(901) 383-9115**

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12. Personal Author(s)

Mason, Chuck; Mulhearn, Brian; Caldwell, Brian, (P.G.#1330, Florida Exp. Date July 31, 1996)

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19. Abstract
This work plan describes background information, study endpoints, sampling techniques, and data quality requirements to be used at Operable Unit 16, Site 41, Wetlands, at NAS Pensacola, Florida to be performed from approximately July 6, 1995 through December 10, 1996 in accordance with the draft NAS Pensacola Site Management Plan.

The purpose of this investigation is to characterize the nature, magnitude, extent, and effects of contaminated sediment and surface water within the wetlands to adequately perform a human health and ecological risk assessment as part of the RI. The investigation will follow a phased approach, starting with a qualitative review of the NAS Pensacola wetlands and possibly leading into more complex studies. If risk can be characterized after any phase of the investigation, further study will be halted. Phase I involves a search for information related to past practices within IR sites and associated wetland areas, including previous investigations at NAS Pensacola. This information will be used to choose those wetlands planned for further study in Phase IIA. Phase IIA involves the collection of surface water and sediment samples within wetlands of likely contamination identified during Phase I.

Phase IIB toxicity tests and diversity studies may be performed if an adverse impact is suspected to occur within a portion of an NAS Pensacola wetland based on the results of Phase IIA. These tests will be used to determine the species diversity of benthic macroinvertebrates and how toxic sediment and surface water is to different trophic level organisms. Both tests will be compared to a reference wetland. These results will link the results of Phase IIA to help determine the overall impact to the wetland of concern. If more information is needed to better characterize risk, the study may move into Phase III.

Phase III involves a more refined assessment of impact by using bioaccumulation studies or a more sensitive species for toxicity testing. This information can be modeled within the food chain to predict effects to higher order species.

After all studies are complete, ecological and human health risk at each wetland of concern can be quantified. Recommendations will be made for remedial alternatives to minimize any known or predicted adverse effects occurring within the wetlands ecosystem.

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FOREWORD

Sediment screening values are used to evaluate sediment contamination and its potential to impact the surrounding ecosystem and to serve as a guide to determine the need for further study. They are not cleanup standards. Generally, if a contaminant detected in the sediment exceeds its sediment screening value, further study may be warranted in the form of diversity studies and toxicity tests. If all contaminants in the sediment fall below their respective sediment screening values, further study may generally not be necessary. However, this may not be the case in all situations. Further study may not be performed if a contaminant exceeds its sediment screening value in a sediment of limited bioavailability. Conversely, further study may be performed if a contaminant does not exceeded its screening value in a sediment where bioavailability appears high. The sediment screening values to be used during this investigation have been established by EPA Region IV.

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EXECUTIVE SUMMARY

This Remedial Investigation (RI) work plan is written for Site 41, the NAS Pensacola wetlands. The purpose of this investigation is to characterize the nature, magnitude, extent, and effects of contaminated sediment and surface water within the wetlands to adequately perform a human health and ecological risk assessment as part of the RI.

The investigation will follow a phased approach, starting with a qualitative review of the NAS Pensacola wetlands and leading into more complex studies as warranted. If ecological and human health risk can be characterized after any phase of the investigation, further study will be halted. Phase I involves a literature search and site reconnaissance related to past practices within IR sites and associated wetland areas, including previous investigations at NAS Pensacola. This information will be used to choose those wetlands planned for further study in Phase IIA. Reference wetlands will also be established as a means of comparison to apparently unimpacted wetlands.

Phase IIA involves the collection of surface water and sediment samples within areas of likely contamination identified during Phase I. For ecological concerns, these results will be compared to State of Florida and EPA acute and chronic surface water criteria and EPA Region IV and Florida sediment screening values. For human health concerns, results will be compared to EPA Region III risk-based residential contaminant screening values and Florida Department of Environmental Protection (FDEP) soil cleanup goals for Department of Defense (DOD) sites. Screening values used in human health and ecological risk assessment are not intended to be cleanup standards or ARARs but are only intended to be an initial comparison. Models may also be used as part of Phase IIA to help determine the source of contamination and whether contaminants may adversely affect the ecosystem or human health.

Phase IIB toxicity tests and diversity studies may be performed if an adverse impact is suspected to occur within a portion of an NAS Pensacola wetland based on the results of Phase IIA. These tests will be used to determine the species diversity of benthic macroinvertebrates and how toxic sediment and surface water is to different trophic level organisms. Both tests will be compared to a reference wetland. These results will link the results of Phase IIA to help determine the overall impact to the wetland of concern. If more information is needed to better characterize risk, the study may move into Phase III.

Phase III involves a more refined assessment of impact by using bioaccumulation studies or a more sensitive species for toxicity testing. This information can be modeled within the food chain to predict effects to higher order species.

After all studies are complete, ecological and human health risk at each wetland of concern can be quantified. Recommendations will be made for remedial alternatives to minimize any known or predicted adverse effects occurring within the wetlands ecosystem.

List of Acronyms and Abbreviations

ARARs	Applicable or Relevant and Appropriate Requirements
ASTM	American Society for Testing and Materials
BNAs	Base Neutral Acid Extractable Compounds
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	Contract Laboratory Program
CSAP	Comprehensive Sampling and Analysis Plan
CWA	Clean Water Act
DOD	Department of Defense
DOT	Department of Transportation
E/A&H	EnSafe/Allen & Hoshall
E&E	Ecology & Environment, Inc.
°F	Degrees Fahrenheit
FAC	Florida Administrative Code
FDA	Florida Department of Agriculture
FDEP	Florida Department of Environmental Protection
FDER	Florida Department of Environmental Regulation
FFA	Federal Facilities Agreement
FGFWFC	Florida Game and Freshwater Fish Commission
FNAI	Florida Natural Areas Inventory
FS	Feasibility Study
FSP	Field Sampling Plan
G&M	Geraghty & Miller, Inc.
HASP	Health and Safety Plan
IR	Installation Restoration Program
K_{oc}	Equilibrium coefficient
LD_{50}	Lethal Dose where 50 percent of population dies
MSL	Mean Sea Level
NADEP	Naval Aviation Depot
NAS Pensacola	Naval Air Station Pensacola, Florida
NWI	National Wetlands Inventory
OLF	Outlying Field
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
PAHs	Polynuclear Aromatic Hydrocarbons
PB	Pensacola Bay
PBS	Pensacola Bay System
PCBs	Polychlorinated Biphenyls
QA	Quality Assurance
QAPP	Quality Assurance Project Plan

QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendment and Reauthorization Act
SCS	Soil Conservation Service
SDWA	Safe Drinking Water Act
SOP/QAM	Standard Operating Procedure/Quality Assurance Manual
SOUTHNAVFACENGCOM	Southern Division Naval Facilities Engineering Command
TAL	Target Analyte List
TCL	Target Compound List
TES	Threatened and Endangered Species
TRPHs	Total Recoverable Petroleum Hydrocarbons
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USDA	United States Department of Agriculture
EPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

As part of the U.S. Navy's Comprehensive Long-Term Environmental Action Navy Program (CLEAN), this Remedial Investigation/Feasibility Study (RI/FS) work plan has been prepared by EnSafe/Allen and Hoshall (E/A&H) for the Southern Division, U.S. Navy, Naval Facilities Engineering Command **[(the Navy),]** as tasked under Contract Number N62467-89-D-0318/CTO-036. This work plan addresses potential contamination in the Naval Air Station Pensacola (NAS Pensacola) Wetlands, Site 41.

This RI/FS work plan has been developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), the Superfund Amendment and Reauthorization Act of 1986 (SARA), the U.S. Navy's Final 1993 Yearly Site Management Plan for NAS Pensacola (U.S. Navy, 1992), and pursuant to the Federal Facility Agreement (FFA) dated October 23, 1990 between the United States Environmental Protection Agency Region IV (EPA Region IV), **[FDEP]** and the U.S. Navy.

This work plan outlines the objectives, approach, and methods to be used in conducting the RI at the wetlands, discusses applicable site background and setting information, and evaluates potential contaminants, contaminant sources, migration pathways, and receptors associated with the wetlands. This work plan addresses only the RI procedures to be performed through site characterization. After the site characterization has been completed, an RI report will be written. **[This RI report will include a baseline risk assessment, addressing risk to both human health and the environment.]**

All investigation activities conducted during this RI/FS will be performed in accordance with *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA 1991a) and *Environmental Compliance Branch — Standard Operating Procedures and*

[Bold items in brackets denote changes to the first draft of document.]

Quality Assurance Manual (SOP/QAM), EPA Region IV, (EPA 1991b) **[and the Comprehensive Sampling and Analysis Plan (CSAP, E/A&H 1994).]** These documents detail the project organization, project objectives, and specific quality assurance/quality control (QA/QC) measures to be followed during the field investigation and laboratory procedures. **[A site specific Sampling and Analysis Plan (SAP, E/A&H, 1995) has been submitted to complement this work plan.]** The SAP has two components, a Field Sampling Plan (FSP) and a site-specific Quality Assurance Project Plan (QAPP). The FSP provides guidance for all fieldwork by detailing the number of samples, sample locations and parameters to be analyzed during the investigation. The QAPP describes site-specific QA/QC measures. A site-specific *Health and Safety Plan* (HASP, E/A&H 1993) has been prepared as a supporting document for this RI work plan **[and outlines health and safety procedures and protocols. The HASP will be submitted to the Navy only. All of the other documents cited above will be submitted to the Navy, EPA, FDEP, and the other resource trustees for review and comment.]**

[Bold items in brackets denote changes to the first draft of document.]

2.0 BACKGROUND INFORMATION

2.1 Facility — NAS Pensacola

NAS Pensacola is located on a peninsula, approximately five miles southwest of the city of Pensacola, in the southeastern portion of Escambia County, Florida (Figure 2-1). This peninsula is bounded on the north by Bayou Grande and on the east and south by Pensacola Bay. NAS Pensacola encompasses approximately 5,800 acres used for housing, administration, training, and industry. The older, eastern portion of the base is the most heavily developed. Industrial activities in this area have involved the production, handling, and disposal of various hazardous material or wastes at several locations. Forrest Sherman Airfield and undeveloped woodland are prevalent on the western portion of the activity. The Navy has identified 20 sites under its Installation Restoration (IR) program at NAS Pensacola for investigation regarding past or present operations and potential site contamination. These sites are described in Section 3.

2.2 Site 41 — NAS Pensacola Wetlands

As shown on Figure 2-1, Site 41 encompasses approximately 81 wetlands or wetland complexes. **[These are not jurisdictional wetlands, but represent the results of an initial field investigation performed by EPA to identify "approximate wetland boundaries" (Parsons and Pruitt 1991). Some wetlands shown on Figure 2-1 are intermittent streams and drainage ditches. However, no wetland area has been excluded from consideration. The wetlands to be studied and the number and location of all samples are discussed in the Site 41 SAP.]**

Palustrine forested wetlands, palustrine scrub-shrub wetlands, palustrine emergent wetlands, and combinations of these can be found inland at NAS Pensacola. Shoreline estuarine emergent wetlands and estuarine aquatic beds can be found in shoreline areas. Wetland categories and characteristics for each of the 82 wetlands are summarized in Appendix A. General descriptions of wetland types encountered at NAS Pensacola are described in Table 2-1.

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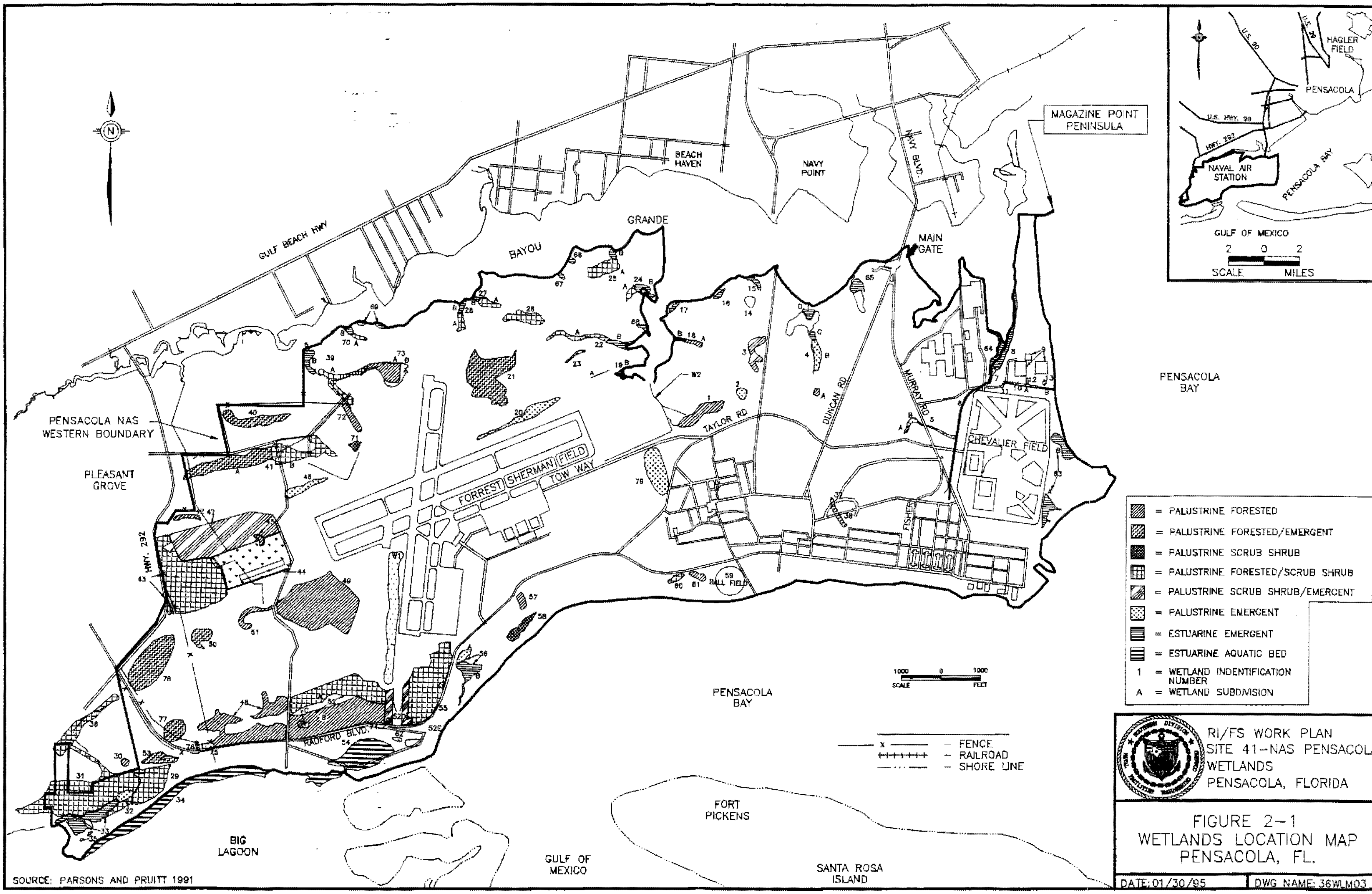
MAGAZINE POINT PENINSULA
HAGLER FIELD
PENSACOLA
U.S. 90
U.S. 29
U.S. HWY. 98
HWY. 292
NAVAL AIR STATION
PENSACOLA BAY
GULF OF MEXICO
SCALE MILES
BEACH HAVEN
NAVY POINT
NAVY BLVD.
GULF BEACH HWY
BAYOU GRANDE
MAIN GATE
PENSACOLA BAY
PENSACOLA NAS WESTERN BOUNDARY
PLEASANT GROVE
TAYLOR RD
DUNCAN RD
MURRAY RD
CHEVALIER FIELD
FORREST SHERMAN FIELD
TOW WAY
FISHER
HWY. 292
BALL FIELD
RADFORD BLVD.
PENSACOLA BAY
BIG LAGOON
GULF OF MEXICO
FORT PICKENS
SANTA ROSA ISLAND
= PALUSTRINE FORESTED
= PALUSTRINE FORESTED/EMERGENT
= PALUSTRINE SCRUB SHRUB
= PALUSTRINE FORESTED/SCRUB SHRUB
= PALUSTRINE SCRUB SHRUB/EMERGENT
= PALUSTRINE EMERGENT
= ESTUARINE EMERGENT
= ESTUARINE AQUATIC BED
1 = WETLAND INDENTIFICATION NUMBER
A = WETLAND SUBDIVISION
SCALE FEET
– FENCE
– RAILROAD
– SHORE LINE
SOURCE: PARSONS AND PRUITT 1991
RI/FS WORK PLAN
SITE 41–NAS PENSACOLA
WETLANDS
PENSACOLA, FLORIDA
FIGURE 2–1
WETLANDS LOCATION MAP
PENSACOLA, FL.
DATE: 01/30/95
DWG NAME: 36WLM03

Table 2-1 Wetland Types	
Palustrine Wetland	Freshwater wetlands both tidal and nontidal; includes inland marshes,swamps, bogs, and shallow ponds
Estuarine Wetland	Deep water tidal habitats and adjacent tidal wetlands usually semi-enclosed by land but have open, partially obstructed, or sporadic access to the ocean. They are at least occasionally diluted by fresh water runoff from the land.
Emergent Wetland	A wetland dominated by erect, rooted, herbaceous aquatic plants.
Forested Wetland	A wetland dominated by trees or woody vegetation at least 6 meters tall.
Scrub-shrub Wetland	A wetland dominated by trees or woody vegetation less than 6 meters tall
Aquatic Bed	Rooted plants growing submerged or having floating leaves. Includes algae or aquatic moss growing at or below the surface.

Source: Mitsch and Gosselink (1986)

The majority of the NAS Pensacola wetlands are in the western portions of the activity. Heavily forested undeveloped or marginally altered zones can be found west of Sherman Field in an area characterized as containing palustrine forested wetlands, or forested wetlands mixed with scrub-shrub vegetation. Also west of Forrest Sherman Field are heavily altered areas which have been cleared of trees and are dominated solely by scrub-shrub vegetation, particularly along runway over-run areas. Many of these altered areas appear to be dry, but contain common wetland plant species. Portions of the forested and scrub-shrub areas have standing water, saturated soil and accommodate wetland plant species. Standing water or saturated soil in these areas support emergent wetland plant species, some of which are considered threatened. Several drainage ditches in the area which support wetland species drain surface runoff from the airfield area into either Bayou Grande or the Intercoastal Waterway/Pensacola Bay.

Additional palustrine wetlands, as well as estuarine wetlands and aquatic beds, are present in the shoreline areas to the south and southwest of Forrest Sherman Field. Estuarine emergent wetlands are present in the inlets off the Intercoastal Waterway/Pensacola Bay, with palustrine emergent species in the more brackish upper-water reaches. Beds of estuarine submerged aquatic plants can be found in the larger coves and immediate offshore areas. Areas of saturated soil inland from the shoreline accommodate palustrine forested and scrub-shrub wetlands, sometimes mixed with emergent plants. Standing water in the same area supports trees, shrubs, and emergent/floating leaf vegetation. Small inlets to Bayou Grande north of Forrest Sherman Field support estuarine emergent wetlands. Many of the estuarine emergent wetlands are fed by palustrine wetlands, especially where the inlet is fed by drainage ditches or intermittent streams.

About one-third of the wetlands are in the more developed eastern portion of NAS Pensacola peninsula; these being almost exclusively smaller, remnant wetlands. These wetlands have been heavily impacted by base activities (E&E 1992a). Isolated palustrine wetlands are near the sanitary landfill, directly west of the NAS Pensacola golf course. Several ponds on this golf course drain into Bayou Grande and support palustrine wetlands inland from the bayou and estuarine wetlands along the shoreline. Areas near Chevalier Field and the wastewater treatment plant contain several small wetlands. Many occur as palustrine forested wetlands in small, isolated wooded areas. Several drainage ditches and a channelized stream with emergent wetland plants direct surface runoff from the area surrounding Chevalier Field into the Yacht Basin, off of Bayou Grande **[and west of the Magazine Point Peninsula]**. Estuarine and palustrine emergent wetlands are located at the upper end of the yacht basin. Two isolated estuarine emergent wetlands lie on the eastern fringe of Chevalier Field, next to Site 14, the Dredge Spoil Fill Area.

2.3 Physical Setting

2.3.1 Climate

The Pensacola area typically experiences a mild subtropical climate as a result of the approximately 30° north latitude and influences of the adjacent Gulf of 31 March 1993 temperatures for this area range from 55° Fahrenheit (°F) in the winter to 81° F in the summer. These temperatures are generally stable; however, temperature extremes of less than 7° F and up to 106° F have been recorded. During summer, thunderstorms frequently occur and can cause a 10 to 20° F drop in air temperature in minutes.

Annual rainfall is fairly high in the Pensacola area, averaging approximately 61 inches per year. Generally, rainfall amounts are highest during the warmer months of July and August, averaging more than 7 inches per month, and lowest during the months of May, October, and November, averaging under 4 inches per month. During summer, high rainfall commonly accompanies thunderstorms and can produce up to 3 to 4 inches of rain within one hour. Due to the higher temperatures, evaporation rates are generally higher during the warmer months, reducing the full recharge potential of the heavy rains. During the cooler months of fall and spring, rainfall is usually less intense but lasts longer, allowing for higher rates of recharge through percolation and infiltration of rainfall.

In the Pensacola area, winds prevail from the north and northwest during the fall and winter, and from the south and southwest during the spring and summer. Wind velocities are usually moderate, but can reach gusting speeds during thunderstorms. During the warmer months, land-sea temperature differentials and the effects of prevailing Atlantic Bermuda High pressures produce a daily clockwise rotation of area winds commonly referred to as the sea-breeze effect. Severe weather is infrequent to the Pensacola area; however, hurricanes and tornadoes have caused significant damage in the past. Since 1980, six hurricanes have passed within 50 miles of Pensacola without touching land in the area (E&E 1992b).

2.3.2 Surface Waters

Pensacola Bay and Bayou Grande, parts of the Pensacola Bay System (PBS), are the major surface water bodies in the immediate area of NAS Pensacola (Figure 2-1). The NAS Pensacola peninsula also contains the wetland areas described in Section 2.2, with many of the wetlands containing standing water. Surface soil is composed primarily of highly permeable sands limiting stream formation. Several naturally occurring intermittent streams and numerous man-made drainage ditches flow south into Pensacola Bay. Some intermittent streams flow north into Bayou Grande from the northern, central and eastern portions of the facility.

2.3.3 Physiography

NAS Pensacola is in the Gulf Coastal Lowlands Subdivision of the Coastal Plain Province physiographic division. Land surface ranges from 0 to approximately 40 feet above mean sea level (msl). The most prominent topographic feature at NAS Pensacola is a bluff paralleling the southern and eastern shorelines. Between the bluff and the shoreline, a nearly level marine terrace occurs at approximately 5 feet above msl. Gently rolling uplands reach elevations of up to 40 feet above msl landward of the bluff (E&E 1992b).

The PBS primarily drains the western highlands physiographic region of the northwest Florida and contiguous areas extending into southeast Alabama. Overall, the PBS is described as a low relief, open, coastal plain estuary, partly blocked by a barrier island backed by a sound or lagoon (Collard 1991).

2.3.4 Soils

Based on soil classification material published by the United States Department of Agriculture (USDA), 18 surface soil types have been delineated at NAS Pensacola. The following section briefly describes each surface type (USDA *in press*). The Unified Soil Classification System

(USCS) designations for the soil types are summarized in Appendix B. Figure 2-2 illustrates the locations of the various USDA soil and surface types listed below:

USDA Soil and Surface Types

- Duckston Sand, 0 to 2 percent slopes
- Duckston-Corolla Complex, 0 to 6 percent slopes
- Pickney Sand
- Croatan and Pickney Soil, 0 to 2 percent slopes
- Dirego Muck, tidal, 0 to 1 percent slopes
- Kureb Sand, 1 to 8 percent slopes
- Newhan-Corolla Complex, rolling, rarely flooded
- Leon Sand, 0 to 5 percent slopes
- Beaches, 1 to 5 percent slopes
- Hurricane Sand, 0 to 5 percent slopes
- Lakeland Sand, 0 to 5 percent slopes
- Resota Sand, 0 to 5 percent slopes
- Arents, Filled, 0 to 3 percent slopes
- Kureb sand, 8 to 15 percent slopes
- Pits, 1 to 4 percent slopes
- Foxworth sand, 0 to 3 percent slopes
- Lakeland sand, 5 to 8 percent slopes
- Urban land, 0 to 3 percent slopes

Several soil types are saturated, flooded, or ponded for a sufficient period of time during the growing season to develop anaerobic conditions in the upper part of the soil favoring the growth of aquatic plants. **[These]** hydric soil types are indicative of wetland conditions (Tiner 1988).

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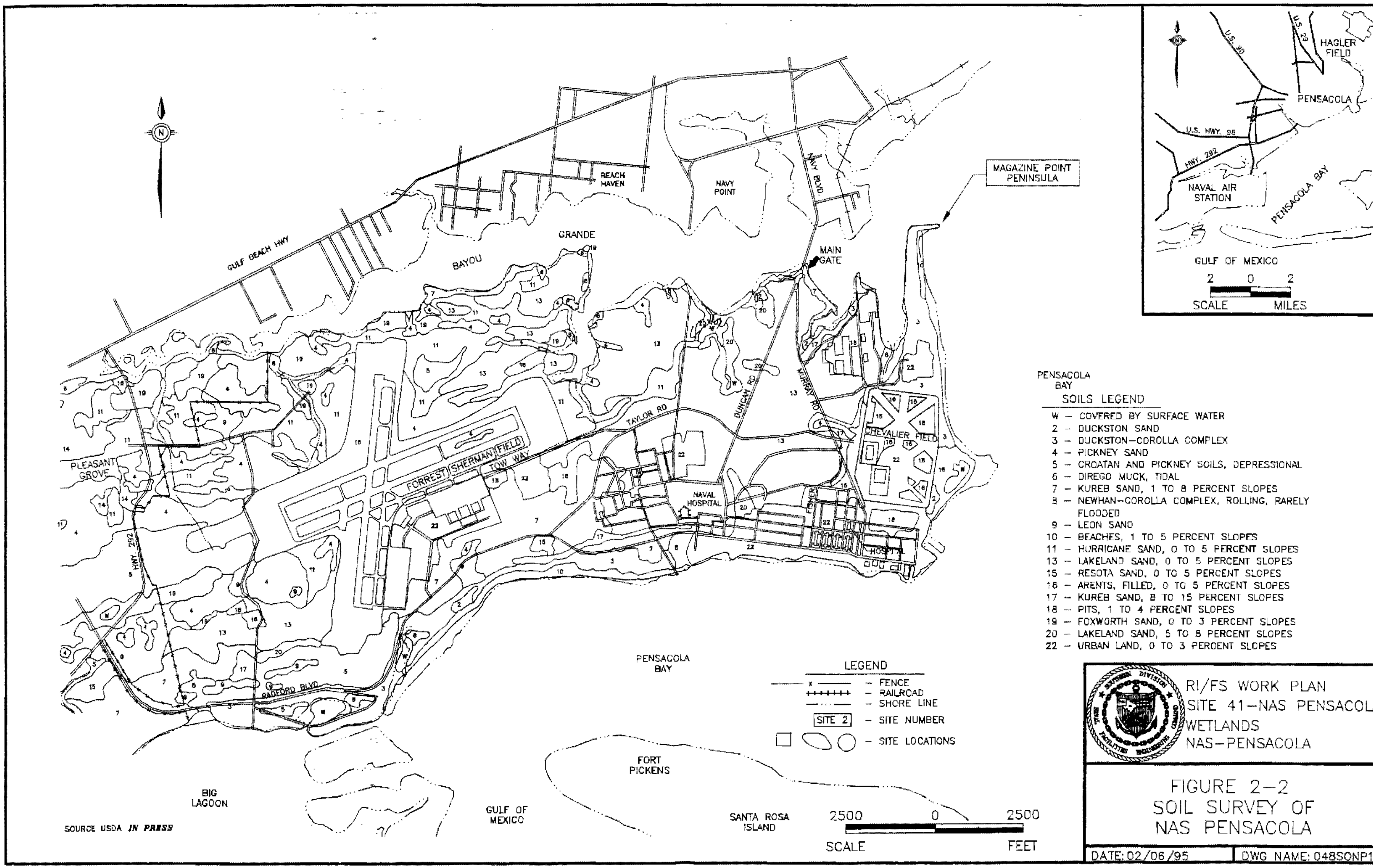


FIGURE 2–2
SOIL SURVEY OF
NAS PENSACOLA

Duckston Sand — The Duckston Sand is a hydric soil consisting of poorly drained sand along the coast at elevations of about 5 feet or less. It has grayish brown and dark grayish brown fine sand surface layers overlying gray sand layers reworked by wind and waves. The soil surface is plane to concave.

Duckston-Corolla Complex — The Duckston-Corolla Complex of hydric soil is moderately well to somewhat poorly drained sand along the coast at elevations of about 5 feet or less. They have Greyish brown and pale brown sand surface layers over dark grayish brown, light brownish gray and gray sand layers. These sands have been reworked by wind and waves.

Croatan and Pickney Soil — This hydric soil consists of very poorly drained soil in depressions and drainageways of the lower coastal plain. Typically, this soil has black, loamy fine sand horizons overlying dark gray fine sand horizons.

Pickney Sand — The Pickney Sand is a hydric soil similar to the Croatan and Pickney Soil, but with a lower high water table range, 0.0 to 0.5 feet for Pickney Sand as compared to the Croatan and Pickney Soil.

Dirego Muck, tidal — The Dirego Muck consists of very poorly drained organic soil occurring in tidal marshes. Typically it has about 28 inches of dark reddish brown muck overlying very dark brown, dark gray and gray fine sand and loamy fine sand extending below a depth of 80 inches.

Kureb Sand — This soil series consists of excessively drained soil on broad undulating ridges and short side slopes of the lower coastal plain. A representative profile is a surface layer of dark gray sand, 3 inches thick, underlain by light gray sand 23 inches thick. The next layer to

[a depth of] 51 inches is brownish yellow, dark brown and light gray sand. The next underlying layer to a depth of 89 inches is pale brown sand.

Newhan-Corolla Complex — This complex consists of Newhan Soil; gently undulating to steep, excessively drained soil along beaches and waterways. In a representative profile, the surface layer is grayish brown fine sand about 2 inches thick. The upper layer is fine sand. The underlying layer to a depth of 72 inches is light gray sand. The moderately well to poorly drained Corolla Soil described with the Duckston-Corolla Complex are also found here.

Leon Sand — This soil series consists of poorly drained sandy soil in the lower Atlantic and Gulf Coastal Plain flatwoods. Typically, this soil has a 3-inch thick, very dark gray sand surface layer and a 12-inch thick gray and light gray sand subsurface layer. The subsoil is black, dark reddish brown and dark brown sand 15 inches thick. The substratum is brown, light brownish gray or very dark brown sand to 80 inches or more deep.

Beaches — This hydric soil consists of sandy shores washed and rewashed by waves. These areas may be partially covered with water during high tides or during storms.

Hurricane Sand — This soil series consists of somewhat poorly drained sandy soil formed in thick sandy marine sediments. They occur on nearly level landscapes, slightly higher than adjacent flatwoods. This soil has a grayish brown surface layer and thick brown, very pale brown and light gray subsurface layers extending to depths of more than 50 inches. Below the subsurface layers are organic-coated layers of dark brown, reddish brown, and black sand.

Lakeland Sand — The Lakeland Sand series consists of excessively drained nearly level to steep soil on coastal plain uplands. Typically, this soil has a very dark grayish brown sand surface layer about 3 inches thick. Yellowish brown sand occurs between depths of 3 and 64 inches. From 64 to depths of 90 inches or more, pale brown sand occurs.

Resota Sands — The Resota Sands consist of moderately well drained, deep sandy soil on nearly level to sloping ridges near the Gulf Coast. Typically, the surface layer is light brownish gray fine sand. The subsurface layer is 15 inches of light gray sand. Below this layer are 23 inches of brownish yellow fine sand underlain by 9 inches of very pale brown fine sand. Extending below this is 90 inches or more of white sand.

Arents — Arents consist of somewhat poorly drained soil formed by the deposition of approximately 32 inches of sandy materials over natural soil. Arents are former low areas since filled for urban development. The sandy depositional material commonly contains limestone fragments in the upper 8 to 10 inches. The remainder of this material is mostly brownish colored sand with pockets of black sand and weakly cemented fragments of dark reddish brown sand.

Pits — Pits are open excavations of removed soil, exposing other material. These type of pits are associated with topsoil or fill material excavations.

Foxworth Sand — This soil series consists of moderately well drained, nearly level to steep soil on coastal plain uplands. Typically, the surface layer is approximately 10 inches of sand. The upper 4 inches is grayish brown and the lower 6 inches is brown. Light yellowish brown sand extends to a depth of 40 inches, followed by a very pale brown sand with a few mottles to 52 inches. Underlying this to a depth of 80 inches or more is light gray and very pale brown sand with yellowish and reddish mottles.

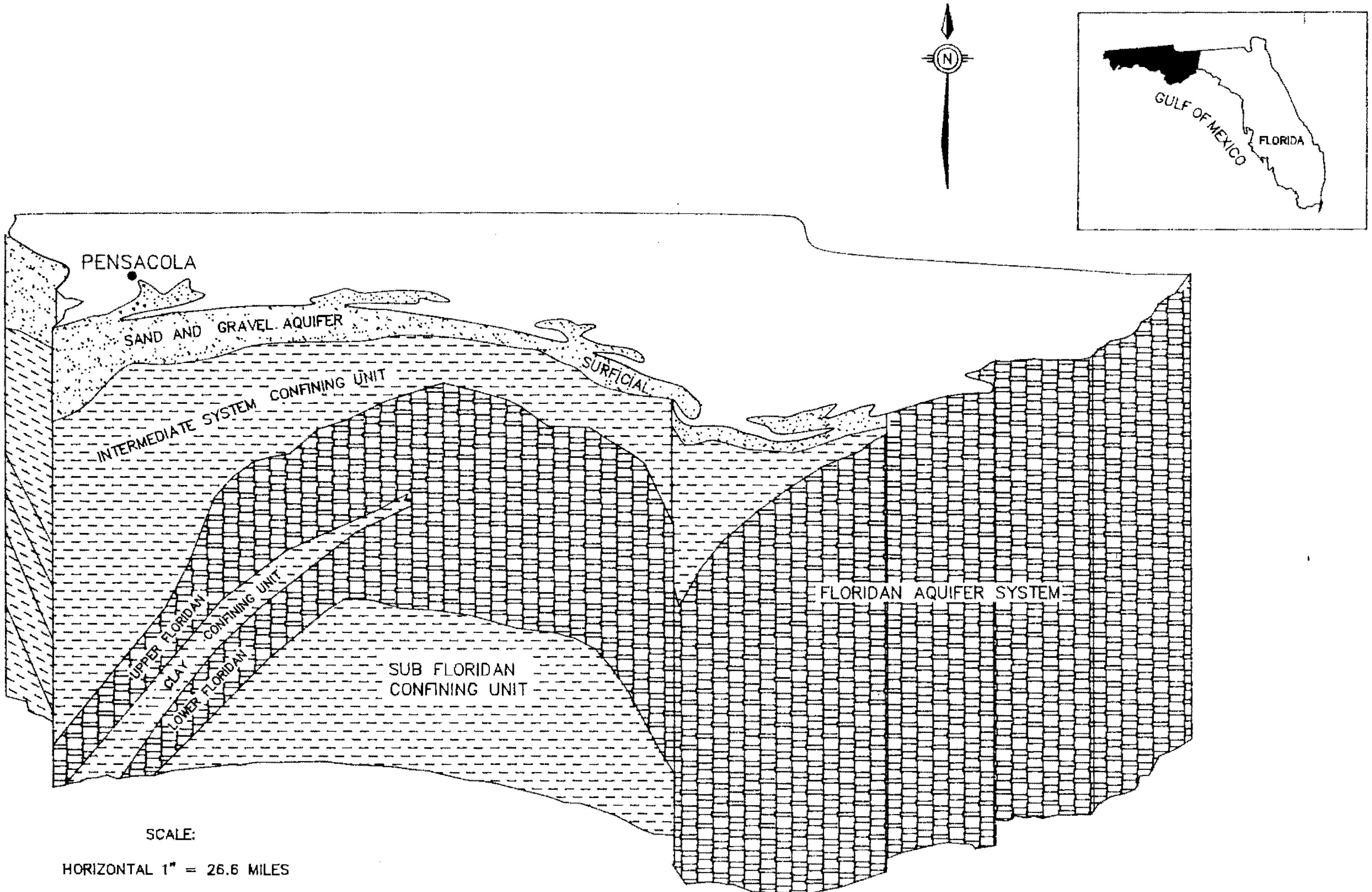
Urban Land — These developed areas contain surfaces covered by streets, parking lots, buildings, and/or other structures.

2.3.5 Hydrogeology

Underlying NAS Pensacola are three principal hydrogeologic units (in descending order): the Sand-and-Gravel Aquifer, the Intermediate System, and the Floridan Aquifer System (E&E 1992b). Figure 2-3 illustrates the extent of these hydrogeologic units across northwest Florida.

Sand-and-Gravel Aquifer — At NAS Pensacola, this aquifer extends from the land surface to a depth of approximately 300 feet bls (Wagner et al. 1984). This hydrogeologic unit primarily consists of sequences of unconsolidated to poorly indurated sand and gravel deposits, with interspersed lenses of clay. In this area of northwest Florida **[west of the Choctawhatchee River]**, the surficial aquifer functions as an important source of water. **[In southern Escambia County, the federal classification for]** groundwater from wells screened in this aquifer is **[Class I: potential or actual discharge into a sensitive ecological environment (EPA, 1986)]**. Because this aquifer is contiguous with land surface and recharged locally through infiltration and percolation, it is susceptible to contamination from surface sources. The sediments comprising this unit area are Pliocene to Holocene Series, and at NAS Pensacola, primarily consist of the **[Pliocene/Pleistocene-age]** Citronelle Formation overlain by a blanket of **[Holocene]** marine terrace deposits. Due to differences in permeabilities, the Sand-and-Gravel aquifer is divided into three zones: the surficial, the low permeability, and the main producing zones (Wilkins *et al.* 1985).

[The] *surficial zone* comprises the uppermost portion of the Sand-and-Gravel Aquifer within the vicinity of NAS Pensacola (Wilkins *et al.* 1985). Numerous borings conducted during previous studies indicate that this zone ranges from 40 to 70 feet thick. The lithology of this zone is



SCALE:

HORIZONTAL 1" = 26.6 MILES

VERTICAL 1" = 500 FEET

VERTICAL EXAGGERATION = 281

SOURCE: E&E 1992c.

RI/FS WORK PLAN
SITE 41–NAS PENSACOLA
WETLANDS
PENSACOLA, FLORIDA

FIGURE 2–3
GENERALIZED GEOLOGIC CROSS–SECTION OF
HYDROGEOLOGIC UNITS IN
NORTHWEST FLORIDA

DWG DATE: 01/30/95 | DWG NAME: 048GE01

described as light tan to brown, fine- to medium-grained quartz sand. Groundwater within the surficial zone exists under water table or perched conditions. The depth of water within this zone ranges from less than 1 foot to approximately 20 feet bls, depending upon land surface elevation and proximity to surface water bodies. The surficial zone is characterized by relatively high permeabilities and horizontal groundwater flow velocities. Hydraulic conductivity values ranging from 16 to 56 feet per day have been calculated for this zone (Geraghty and Miller (G&M) **[1984]**). Groundwater flow within the surficial zone is generally controlled by local topography and discharge to surface water bodies. **[The FDEP classification of the surficial zone is G-1 and the EPA classification is IIA. The main producing zone of the surficial aquifer, which is used as a potable water source, is overlain by a confining unit.]**

[The] *low permeability zone* underlies the surficial zone at NAS Pensacola (Wilkins *et al.* 1985). This zone is comprised primarily of clay- to silt-size sediments acting as a confining or semi-confining unit, inhibiting vertical groundwater flow between the surficial and the main producing zone. Laboratory permeability tests indicate vertical hydraulic conductivities for this zone **[ranging]** from 4.2×10^{-5} to 9.9×10^{-2} feet per day (G&M 1984). The lithology of the low permeability zone at NAS Pensacola has been described as gray to blue, silty, sandy, slightly fossiliferous clay ranging from 8 to 40 feet in thickness **[(E&E 1992a)]**. This zone has been encountered in numerous borings completed across the base and is generally **[considered to be laterally persistent]** at the facility. No wells are known to be open to the low permeability zone at NAS Pensacola; therefore, the **[occurrence and]** direction of groundwater flow within this zone is not known (E&E 1992b).

[The] *main producing zone* is the lowermost portion of the Sand-and-Gravel Aquifer (Wilkins *et al.* 1985). The zone is comprised primarily of sand and gravel deposits interspersed with minor amounts of clay and silt. The main producing zone characteristically has the highest permeabilities within the surficial aquifer due to the presence of thick beds of coarse-grained materials.

Most major producing wells within the Pensacola area are open to this zone. Three production wells at NAS Pensacola are screened in this zone; however, due to the high iron content in this water, these wells are used infrequently. Production wells at Corry Field, 3 miles north of NAS Pensacola, are principal sources of water for NAS Pensacola.

The depth **[to]** the main producing zone varies significantly from approximately 60 to 120 feet bls. The thickness of this zone **[also varies]**, but is estimated **[to be as thick]** as 300 feet at NAS Pensacola (Wilkins *et al.* 1985). **[In southern Escambia County]** groundwater flow within the main producing zone is generally **[toward the larger water bodies (i.e., Pensacola Bay to the east, Perdido Bay to the west and the Gulf of Mexico to the south)]**. Groundwater in this zone is generally **[subject to]** confined or semi-confined conditions due to the overlying low permeability zone. Depending on the location and surface elevation of the area, positive or negative vertical gradients have been **[measured between]** wells screened in the main producing zone **[and wells screened in the surficial zone. Water levels measured in]** wells in low-topography areas near surface water bodies indicate a potential for upward groundwater flow to the surficial zone. Conversely, **[water levels measured in]** wells in high-topographic areas indicate a potential for downward groundwater flow from the surficial zone into the main producing zone (E&E 1992b).

Intermediate System — The Intermediate System is an extensive hydrogeologic unit of lower permeability immediately underlying the Sand-and-Gravel Aquifer in the vicinity of NAS Pensacola (Wilkins *et al.* 1985). In this area, the Intermediate System is approximately 300 feet bls and approximately 1,100 feet thick. The top of this unit correlates with the Miocene Coarse Clastics, while the remainder comprises the lower portion of the Miocene Coarse

Clastics, the Upper Member of the Pensacola Clay, the Escambia Sand Member of the Pensacola Clay, and the Lower Member of the Pensacola Clay, all of Miocene Age. This unit is primarily composed of fine-grained **[material]** acting as an effective confining unit between the overlying Sand-and-Gravel Aquifer and the underlying Floridan Aquifer System. The water-bearing properties of this unit are poor; however, there are thin stringers or beds of sandy sediments within the sequence possibly producing small amounts of **[ground]**water (E&E 1992b).

Floridan Aquifer System — The Floridan Aquifer System immediately underlies the Intermediate System in the vicinity of NAS Pensacola at a depth of approximately 1500 feet bls (E&E 1992b). In this area, the unit comprises the Chickasawhay Limestone and undifferentiated Tampa Limestone. Groundwater from this aquifer is highly mineralized in **[southern Escambia County]** and is not potable (Wagner *et al.* 1984).

2.3.6 Regional Geologic Structure

The hydrogeology in the NAS Pensacola vicinity is primarily influenced by the Gulf of Mexico Sedimentary Basin (E&E 1992a), a regionally extensive negative feature which is the cause of the southwest dip in northwest Florida's strata. To the east of the Gulf of Mexico Sedimentary Basin are two other dominant structural features: the Apalachicola Embayment and the Chattahoochee Anticline. Because of their location (further east and north of NAS Pensacola), these structures have had little impact on NAS Pensacola-specific hydrogeology. Figure 2-4 illustrates the approximate location of these structures in northwest Florida.

2.4 Previous Investigations

In 1987, the U. S. Fish and Wildlife Service (USFWS 1987) published a Comprehensive Natural Resources Management Plan for NAS Pensacola and Outlying Field (OLF) Bronson, Pensacola, FL. The study briefly described the management of NAS Pensacola wetland areas and contained maps depicting locations and descriptions of each wetland tract. This information

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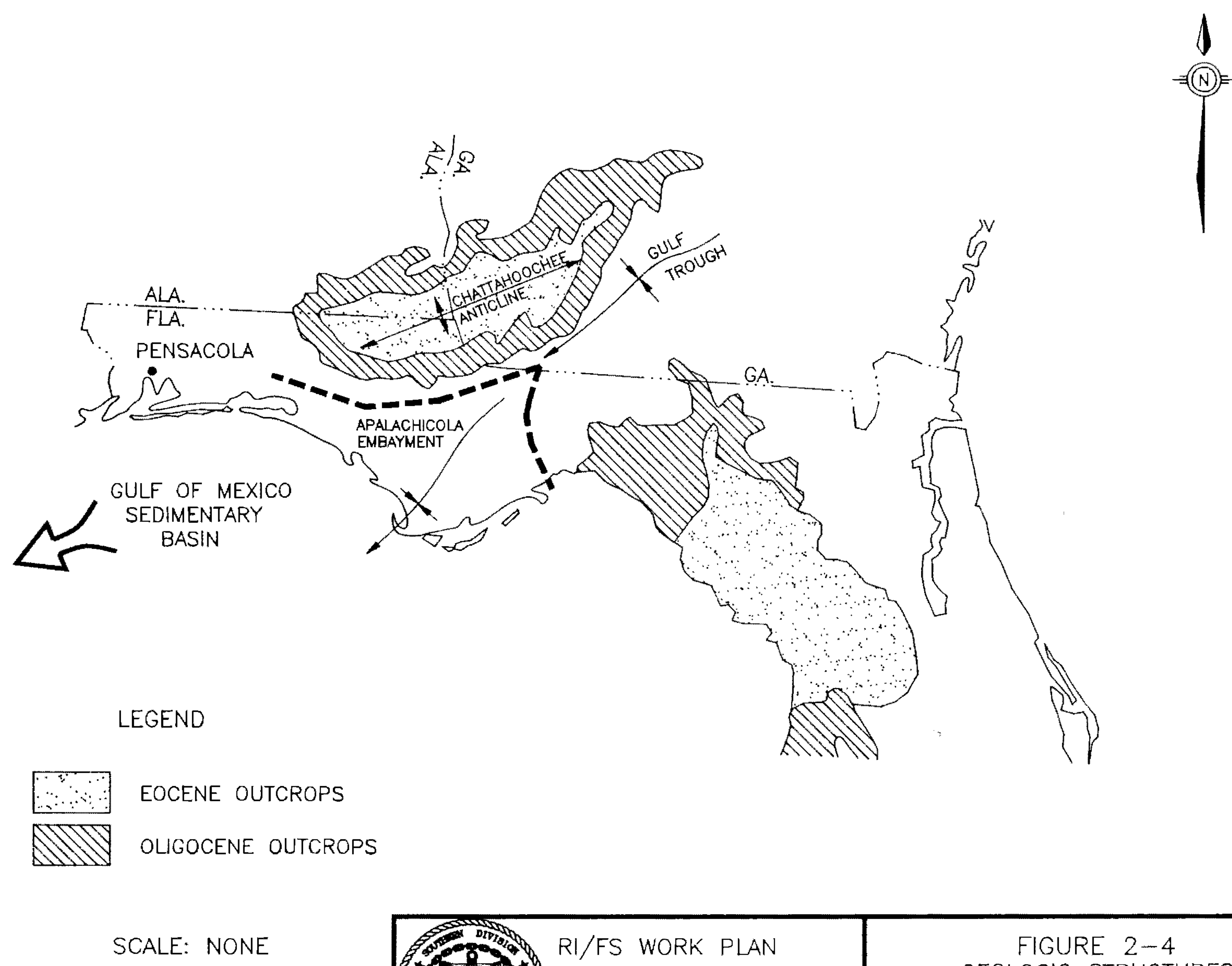

SOURCE: E&E 1992b.

RI/FS WORK PLAN
SITE 41 NAS PENSACOLA WETLANDS
PENSACOLA, FLORIDA

FIGURE 2-4
GEOLOGIC STRUCTURES OF THE NORTHWEST FLORIDA REGION

DWG DATE: 01/30/95 | DWG NAME: 036GE02

was compiled using U. S. Geological Survey (USGS) topographic maps and National Wetland Inventory (NWI) wetland habitat map overlays integrated with a cartographic software program. The study did not mention any field work performed in conjunction with the map classification.

In 1990, EPA inventoried and classified the wetlands present at NAS Pensacola according to vegetation, hydrology, and soil type (Parsons and Pruitt 1991). In addition to classifying the NAS Pensacola wetlands, the study updated information on critical habitats at NAS Pensacola, delineated approximate wetland boundaries/communities, and mapped the results. Wetlands were identified according to procedures outlined in the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (Federal Interagency Committee for Wetland Delineation 1989). Resources used included: (1) aerial photographs, (2) USGS topographic maps, (3) USDA Soil Conservation Service (SCS) soil surveys for Escambia County, FL, and (4) USFWS/NWI classification maps. Field surveys of the wetland areas were also conducted. A wetlands inventory map detailing the results of this investigation shows the location, approximate size, and type for each wetland within the NAS Pensacola boundaries.

A Data Summary and Preliminary Scoping Report prepared by Ecology and Environment (E&E 1992a) for NAS Pensacola outlined potential sources possibly threatening NAS Pensacola wetlands by site and by contaminant pathways. It also estimated the risk associated with contamination possibly found in the wetlands. The report identified 22 sites potentially affecting 32 wetlands near Chevalier Field, Forrest Sherman Field, and the sanitary landfill and listed potential biological receptors of contaminants within the impacted wetlands. Eight wetlands were sampled as part of **[E&E's]** Phase I investigations within the potentially impacted areas. Primary Sediment and Surface Water Contaminants Detected During [E&E's] Phase I Investigations include metals, volatile organic compounds (VOCs), total recoverable petroleum hydrocarbons (TRPHs), polynuclear aromatic hydrocarbons (PAHs), phenols, polyclorinated biphenyls (PCBs), and base/neutral extractable compounds (BNAs).

The sampling locations and analytical results for the sediment and surface water samples collected during these E&E Phase I investigations are presented in Appendix C **[along with results from pertinent studies conducted by the EPA and Groundwater Technology Government Services, Inc. With the exception of the E&E sample results, all other sample results are described in greater detail in the Site 41 SAP.]**

2.5 Ecological Resources

An EPA inventory of wetlands (Parsons and Pruitt 1991) identified and enumerated 79 wetlands or wetland complexes on NAS Pensacola. Two of the 79 wetlands were described in the EPA's final report as non-wetlands. Wetland 14 is described as a non-wetland sand pit, and Wetland 59 is described as having been converted to ball fields. However, two additional wetlands were identified during Phase I habitat/biota surveys conducted by E&E in 1991 as Wetland W1 and Wetland W2. These two wetlands form drainage areas to the northeast and southwest of Sherman Field (E&E 1992a), making up the 81 wetlands identified as Site 41. All of the wetlands were previously shown on Figure 2-1.

Many of the NAS Pensacola wetlands cited by Parsons and Pruitt (1991) are organized into subgroups (e.g., Wetland 52 is subdivided into Wetlands 52A, 52B, 52C, 52D, 52E). Counting these individual wetland fractions brings the total number of wetlands identified by the EPA and E&E to an actual number of 101 wetland segments within the NAS Pensacola boundary.

- Eleven wetlands/fractions are palustrine forested wetlands.
- Twelve wetlands/fractions are palustrine forested/emergent wetlands.
- Sixteen wetlands/fractions are palustrine forested/scrub-shrub wetlands.
- Four wetlands/fractions are palustrine scrub-shrub wetlands.
- Four wetlands/fractions are palustrine scrub-shrub/emergent wetlands.
- Twenty-seven wetlands/fractions are palustrine emergent wetlands.

- Twenty-five wetlands/fractions are estuarine emergent wetlands.
- Two wetlands/fractions are estuarine aquatic beds.

Palustrine Forested Wetlands

Palustrine forested wetlands are comprised of wet pine flatwoods. These forested wetlands have canopies dominated by slash pine *(Pinus elliottii)*, sweetbay magnolia *(Magnolia virginiana)*, black willow *(Salix nigra)*, pond cypress *(Taxodium ascendens)*, and black gum *(Nyssa sylvatica)*. The understory generally consists of yaupon *(Ilex vomitoria)*, black titi *(Cliftonia monophylla)*, saw palmetto *(Serenoa repens)*, wax myrtle *(Myrica cerifera)*, wiregrass *(Aristida stricta)*, dahoon holly *(Ilex cassine)*, and inkberry *(Ilex glabra)*. Birds common to wet pine flatwoods include red-shoulder hawk *(Buteo lineatus)*, blue jay *(Cyanocitta cristata)*, northern mockingbird *(Mimus polyglottos)*, boat-tailed grackle *(Cassidix major)*, marsh wren *(Cistothorus palustris)*, and tufted titmouse *(Parus bicolor)* (E&E 1992a). Other typical fauna include the ring-neck snake, narrow-mouthed toad, cotton rat, opossum, squirrel, rabbit, and raccoon (USFWS 1987).

Palustrine Forested/Emergent Wetlands

Palustrine forested/emergent wetlands are dominated by black willow, slash pine, sweetbay magnolia, pond cypress, and bald cypress *(Taxodium distichium)*. The understory includes wiregrass, black titi, smartweed *(Polygonum* sp.*)*, spike rush *(Eleocharis* sp.*)*, cinnamon fern *(Osmunda cinnamomea)*, pennywort *(Hydrocotyle* sp.*)*, chain fern *(Woodwardia* sp.*)*, saw grass *(Cladium jamaicense)*, and redroot *(Lachnanthes caroliniana)* (Parsons and Pruitt 1991). **[The Preliminary]** investigation of Wetland 40 during October 1992 **[by E/A&H]** indicated the presence of the white-top pitcher plant *(Sarracenia leucophylla)* listed by the Florida Natural Areas Inventory (FNAI) as endangered for Escambia County (FNAI 1988). Birds in this habitat include blue jay, northern mockingbird, boat-tailed grackle, and marsh wren (E&E 1992a).

Palustrine Forested/Scrub-Shrub Wetlands

The palustrine forested/scrub-shrub wetlands are dominated by black willow, sweetbay magnolia, slash pine, and water tupelo *(Nyssa aquatica)*. The understory includes wiregrass, inkberry, black titi, cabbage palm *(Sabal palmetto)*, myrtle-leaf holly *(Ilex myrtifolia)*, and swamp titi *(Cyrilla racemiflora)* (Parsons and Pruitt 1991). During October 1992 black needlerush *(Juncus roemerianus)* was identified in the understory. Animals inhabiting these wetlands include various frogs, snakes, lizards, birds, and small mammals (Wolfe, *et al.* 1988).

Palustrine Scrub-Shrub Wetlands

The palustrine scrub-shrub wetlands are dominated by swamp titi, buttonbush *(Cephalanthus occidentalis)*, and broad-leaved cattail *(Typha latifolia)* (Parsons and Pruitt 1991). Frogs, snakes, lizards, birds, and small mammals make up the animal population (Wolfe *et al.* 1988).

Palustrine Scrub-Shrub/Emergent Wetlands

Palustrine scrub-shrub/emergent wetlands are dominated by sweetbay magnolia, inkberry, black titi, redroot, broad-leaved cattail, sweet pepperbush *(Clethra alnifolia)*, arrowhead *(Sagittaria lancifolia)*, and lizard's tail *(Saururus cernus)* (Parsons and Pruitt 1991). These wetlands have standing water and provide habitat for various terrestrial, avian, and aquatic fauna.

Palustrine Emergent Wetlands

Palustrine emergent wetlands are dominated by arrowhead, broad-leaved cattail, pennywort, sawgrass, redroot, black needlerush, lizard's tail, maidencane *(Panicum hemitomon)*, swamp milkweed *(Asclepias* sp.*)*, mild water pepper *(Polygonum hydropiperoides)*, and bushy beardgrass *(Andropogon glomeratus)* (Parsons and Pruitt 1991). During **[preliminary]** investigation of Wetlands 44 and W1 in October 1992, the presence of sundew *(Drosera* sp.*)* was also identified. It is listed by the FNAI as endangered for Escambia County, FL (FNAI 1988). The State of Florida lists this species as threatened. Additionally, the **[preliminary]** investigation

[Bold items in brackets denote changes to the first draft of document.]

of Wetland 5B identified the presence of Carolina Lilaeopsis *(Lilaeopsis carolinensis)*, also listed on the FNAI species of concern list. However, the Carolina Lilaeopsis is not being considered for listing at either the state of federal level. Waterfowl, amphibians, reptiles and various mammals inhabit these wetlands (USFWS 1987).

Estuarine Emergent Wetlands

Estuarine emergent wetlands are dominated by black needlerush, sawgrass, saltmeadow cordgrass *(Spartina patens)*, and giant reed *(Phragmites australis)* (Parsons and Pruitt 1991). Many birds inhabit estuarine wetlands, including terns *(Sterna* sp.*)*, herons *(Ardea herodias)*, ducks *(Anas* sp.*)*, sandpipers *(Calidris* sp.*)*, egrets *(Egretta thula/Casmerodius albus)*, skimmers *(Rynchops niger)*, and osprey *(Pandion haliaetus)* (E&E, 1992a). Some of these birds are listed as endangered by the FNAI. Large numbers of macroinvertebrates in these tidal marshes feed fish and waterfowl.

Estuarine Aquatic Beds

Two estuarine aquatic beds are located at NAS Pensacola. Wetland 54 is a 26-acre seagrass bed within Sherman's Cove. Wetland 34 contains intermittent seagrass beds lying off the southwest NAS Pensacola shoreline. These are comprised of turtle grass *(Thallasia testudinum)*, manatee grass *(Syringodium filiforme)*, and shoal grass *(Halodule wrightii)* (Parsons and Pruitt 1991). Seagrass beds perform many critical functions in the coastal environment. They support a diverse marine community, possibly including important transient species such as sea turtles and manatees, classified as threatened or endangered species (Table 2-1). They also provide habitat for a large group of invertebrate species and refuge from predators for many forms of juvenile fish. They also provide a large source of organic matter, supporting the estuarine food chain, and serve as a major link in the main biochemical cycles of the coastal area (Wolf *et al.* 1988).

[Species of concern locations relative to NAS Pensacola wetlands are shown on Figure 2-5 followed by a legend describing the species and its legal status. Figure 2-5 is based on the most recent information obtained from the Florida Natural Areas Inventory (FNAI 1992). Figure 2-5 cannot be construed as the most accurate interpretation of the distribution of species of concern at NAS Pensacola. A visual inspection during Phase I would also likely be required. To account for this, other species of concern not confirmed but possibly living within the NAS Pensacola wetlands are described in Table 2-2 and may be considered during Phase I of this investigation.]

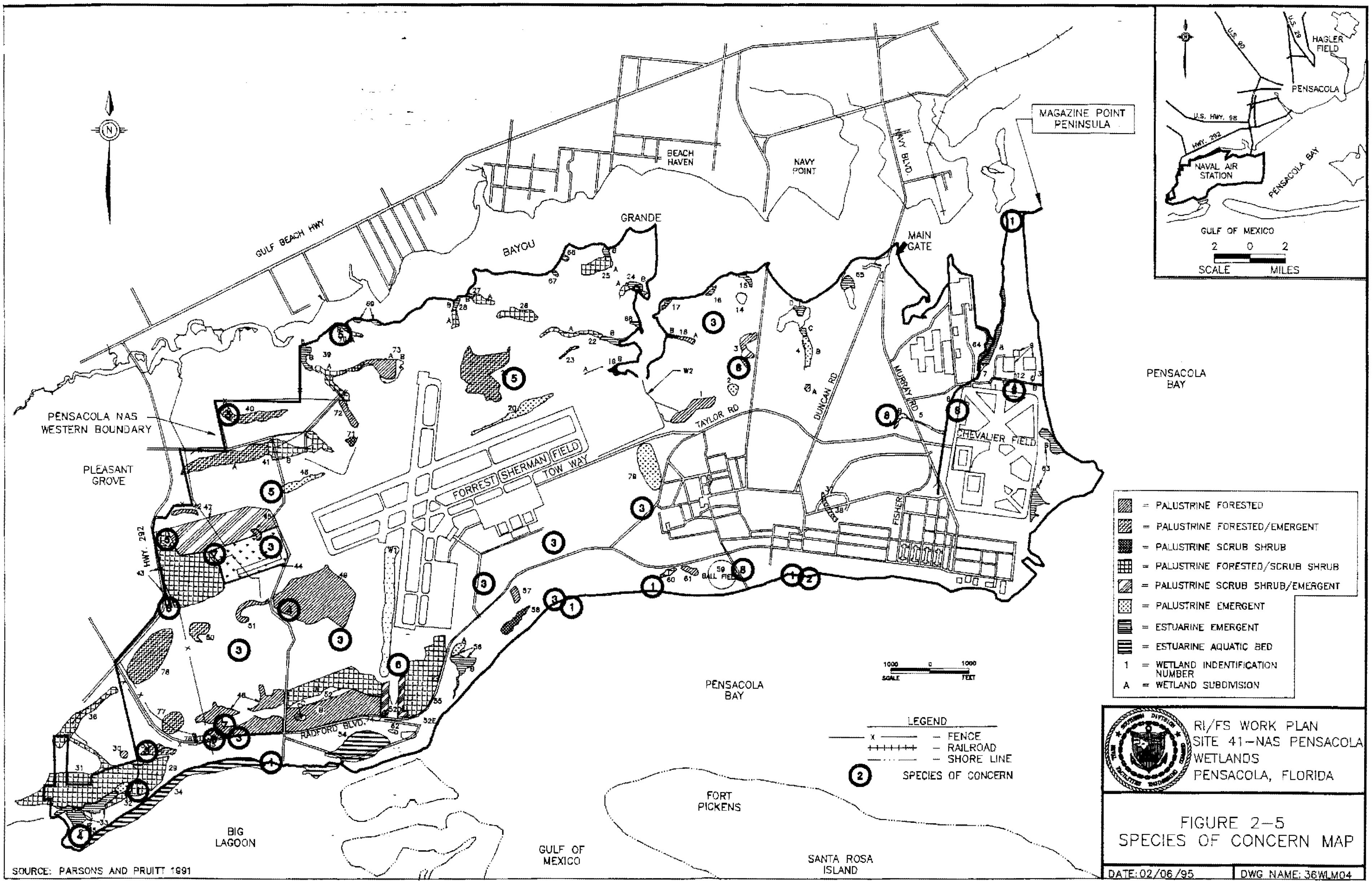
MAGAZINE POINT PENINSULA
BEACH HAVEN
NAVY POINT
HWY BLVD.
MAIN GATE
GULF BEACH HWY
BAYOU
GRANDE
PENSACOLA BAY
PENSACOLA NAS WESTERN BOUNDARY
PLEASANT GROVE
HWY. 292
TAYLOR RD
DUNCAN RD
MURRAY RD
CHEVALIER FIELD
FORREST SHERMAN FIELD
TOW WAY
FISHER
BALL FIELD
RADFORD BLVD.
PENSACOLA BAY
FORT PICKENS
BIG LAGOON
GULF OF MEXICO
SANTA ROSA ISLAND
SOURCE: PARSONS AND PRUITT 1991
U.S. 90
U.S. 29
HAGLER FIELD
PENSACOLA
U.S. HWY. 98
HWY. 292
NAVAL AIR STATION
PENSACOLA BAY
GULF OF MEXICO
SCALE MILES
= PALUSTRINE FORESTED
= PALUSTRINE FORESTED/EMERGENT
= PALUSTRINE SCRUB SHRUB
= PALUSTRINE FORESTED/SCRUB SHRUB
= PALUSTRINE SCRUB SHRUB/EMERGENT
= PALUSTRINE EMERGENT
= ESTUARINE EMERGENT
= ESTUARINE AQUATIC BED
1 = WETLAND INDENTIFICATION NUMBER
A = WETLAND SUBDIVISION
LEGEND
— FENCE
— RAILROAD
— SHORE LINE
SPECIES OF CONCERN
RI/FS WORK PLAN
SITE 41-NAS PENSACOLA
WETLANDS
PENSACOLA, FLORIDA
FIGURE 2-5
SPECIES OF CONCERN MAP
DATE: 02/06/95
DWG NAME: 36WLM04

Figure 2-5

LEGEND

Number	Common Name	Scientific Name	Federal/State Legal Status
1	Godfrey's Golden Aster	*Chryopsis godfreyi*	C2/N
2	Gulf Rockrose	*Helainthemum arenicola*	N/N
3	Large-Leaved Jointweed	*Polygonella macrophylla*	C1/LT
4	Osprey	*Pandion haliaetus*	N/LS
5	White-Top Pitcher Plant	*Sarracenia leucophylla*	C2/LE
6	Spoon-Flower	*Peltandra sagittifolia*	N/N
7	Spoon-Leaved Sundew	*Drosera intermedia*	N/LT
8	Carolina Lilaeopsis	*Lilaeopsis carolinensis*	3C/N

[RANK EXPLANATIONS
FEDERAL

C1 **Candidate Species for addition to the List of Endangered and Threatened Wildlife and Plants, Category 1. The USFWS currently has substantial information on hand to support the biological appropriateness of proposing to list the species as endangered or threatened. However, the species is not yet officially listed and currently has no legally protected status.**

C2 **Candidate Species, Category 2. Information on taxa now in possession of the USFWS indicates that proposing to list the species as endangered or threatened is possibly appropriate, but conclusive data on biological vulnerability and threat(s) are not currently available to support proposed rules at this time.**

3C **Category 3C. Taxa have proven to be more abundant or widespread than was previously believed and/or those not subject to any identifiable threat.**

N **Not currently listed or being considered for addition to the List of Endangered and Threatened Wildlife and Plants.**

STATE

LE **Listed as Endangered Plants in the Preservation of Native Flora of Florida Act. Defined as a species of plants native to the state in imminent danger of extinction within the state. Survival is unlikely if the causes of a decline in the number of plants continue, and includes all species determined to be endangered or threatened pursuant to the Federal Endangered Species Act of 1973 as amended.**

LT **Listed as Threatened Plants in the Preservation of Native Flora of Florida Act. Defined as a species native to the state in rapid decline in the number of plants within the state, but has not so decreased in such number to cause them to be endangered.**

LS **Listed as a species of Special Concern by the FGFWFC (Florida Game and Freshwater Fish Commission). Defined as a species, subspecies, or isolated population warranting special protection, recognition, or consideration because it has an inherent significant vulnerability to habitat modification, environmental alteration, human disturbance, or substantial human exploitation, and in the foreseeable future may result in its becoming a threatened species.**

N **Not currently listed, nor being considered for listing.]**

[Bold items in brackets denote changes to the first draft of document.]

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Table 2-2
Threatened and Endangered Flora and Fauna
Observed or Likely to Occur within Habitats of Pensacola Wetlands

Scientific Name	Common Name	Base Status*	Status*: FGFWFC (or FDA)	Status*: USFWS	Habitat
FISHES					
Ammocrypta asprella	Crystal darter	U	T	UR 2	Fresh water
Etheostoma histrio	Harlequin darter	U	SSC		Fresh water
Fundulus jenkinsi	Salt marsh topminnow	P	SSC		Salt, fresh, brackish waters
Lepisosteus spatula	Alligator gar	U	SSC		Brackish, fresh salt water
Moxostoma carinatum	River redhorse	U	SSC		Fresh water
AMPHIBIANS AND REPTILES					
Alligator mississippiensis	American alligator	R	SSC	T	Swamps, marshes, ponds
Drymarchon corias couperi	Eastern indigo snake	P	T	T	Open areas near water
Graptemys pulchra	Alabama map turtle	U	SSC		Swamps, streams, marshes, ponds
Macroclemys temmincki	Alligator snapping turtle	SR	SSC	UR2	Swamps, marshes, ponds
BIRDS					
Charadrius melodus	Piping plover	P	T	T	Open, dry, sandy beaches

[Bold items in brackets denote changes to the first draft of document.]

Table 2-2
Threatened and Endangered Flora and Fauna
Observed or Likely to Occur within Habitats of Pensacola Wetlands

Scientific Name	Common Name	Base Status[a]	Status[b] FGFWFC (or FDA)	Status[b] USFWS	Habitat
BIRDS cont.					
Charadrius alexandrinus	Snowy plover	P	T	UR2	Open, dry, sandy beaches
Dendroica dominica stoddardi	Stoddard's yellow-throated warbler	P-U		UR2	Wooded habitats
Dendroica kirtlandii	Kirtland's warbler	U	E	E	Wooded habitats
Haematopus palliatus	American oystercatcher	U	SSC		Coastal habitats
Egretta rufescens	Reddish egret	P-U	SSC	UR2	Freshwater/coastal wetlands
Egretta caerulea	Little blue heron	P-U	SSC		Freshwater/coastal wetlands
Egretta thula	Snowy egret	P-U	SSC		Freshwater/coastal wetlands
Grus canadensis pratensis	Florida sandhill crane	U	T		Freshwater wetlands
Falco perigrinus tundrius	Arctic peregrin falcon	M	E	T	Winters on the coast
Falco sparverius paulus	Southeastern kestrel	R	T	UR2	Open pine forests, clearings
Haliaeetus leucocephalus	Bald eagle	P-U	T	E	Pine forests/coastal
Pandion haliaetus	Osprey	R	SSC		Near water
Pelecanus occidentalis	Brown pelican	R	SSC	AC	Mangrove trees, coasts

[Bold items in brackets denote changes to the first draft of document.]

Table 2-2
Threatened and Endangered Flora and Fauna
Observed or Likely to Occur within Habitats of Pensacola Wetlands

Scientific Name	Common Name	Base Status[a]	Status[b] FGFWFC (or FDA)	Status[b] USFWS	Habitat
BIRDS cont.					
Picoides borealis	Red-cockaded woodpecker	P-U	T	E	Cavity nests/old pine stands
Vermivora bachmanii	Bachmann's warbler	U	E	E	Wooded habitats
Campephilus principalis	Ivory-billed woodpecker	U	E	E	Wooded habitats
Sterna antillarum	Least tern	U	T		Coastal habitats
Mycteria americana	Wood stork	U	E	E	Freshwater/coastal wetlands
Rostrhamus sociabilis	Snail kite	U	E	E	Freshwater/coastal wetlands
PLANTS					
Drosera intermedia	Spoon-leaved sundew	R	T		Aquatic habitats
Kalmia latifolia	Mountain laurel	U	T		Rich, moist, shady woods
Lilaeopsis carolinensis	Carolina lilaeopsis	R		UR2	Aquatic habitats
Lilium iridollae	Panhandle lily	U	E	UR2	Black, mucky soil
Pinguicula planifolia	Chapman's butterwort	U	RE	UR2	
Rhododendron austrinum	Orange azalea	U	E	UR5	Moist, woody habitats

[Bold items in brackets denote changes to the first draft of document.]

Table 2-2
Threatened and Endangered Flora and Fauna
Observed or Likely to Occur within Habitats of Pensacola Wetlands

Scientific Name	Common Name	Base Status[a]	Status[b] FGFWFC (or FDA)	Status[b] USFWS	Habitat
PLANTS cont.					
Sarracenia leucophylla	White-top pitcher plant	R	E		Open acid bogs
Sarracenia rubra	Sweet pitcher plant	U	E	UR2	Acid bogs/slash pine woods

Source: Ecology and Environment, Inc., 1992a after Florida Natural Inventory 1988.

Key:
[a]Status of species on the NAS Pensacola facility:
R = Resident
M = Migrant
SR = Suspected resident
P = Possible resident due to available habitat; survey required.
U = Unknown; survey required.
[b]State and Federal Status:
E = Endangered
T = Threatened
AC = Agency concern: not currently listed or a candidate for listing
UR 2 = Under review, insufficient biological data available
UR 5 = Candidate species but taxa has proven to be more widespread than previously believed and/or those species are not subject to any identifiable threat.
FDA = Florida Department of Agriculture
FGFWFC = Florida Game and Freshwater Fish Commission
USFWS = U. S. Fish and Wildlife Service
SSC = Species of Special Concern

[Bold items in brackets denote changes to the first draft of document.]

3.0 INITIAL EVALUATION

3.1 Applicable or Relevant and Appropriate Requirements (ARARs) and Screening Values

The proposed scope of work for the RI/FS at Site 41 will be discussed in Section 4 of this work plan and dctailed in the SAP. In developing this scope of work, it was anticipated that data would be evaluated with regard to CERCLA, SARA, and other ARARs. The ARARs potentially applicable to this investigation are listed below. The applicability of these ARARs will be reviewed and updated during this investigation along with the development and analysis of remedial alternatives.

Preliminary Federal ARARs

- Clean Water Act (CWA) 40 CFR Parts 230, 231, 403.5, and 122-125
- Safe Drinking Water Act (SDWA) 40 Code of Federal Regulations (CFR) Part 141
- Clean Air Act (CAA) 40 CFR Parts 52 and 61
- Occupational Safety and Health Act (OSHA) 29 CFR 1910.1000
- Resource Conservation and Recovery Act (RCRA) 40 CFR Parts 264, 265, 268, 270, and 271
- Department of Transportation (DOT) 49 CFR Parts 170-173
- Endangered Species Act (16 USC 1531 et. seq.); 50 CFR Part 200 and 402
- Fish and Wildlife Coordination Act (16 USC 661 et. seq.); 40 CFR Part 6.302

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- Executive Order 11988, Floodplains Management, 40 CFR Part 6, Appendix A

- Executive Order 11990, Protection of Wetlands, 40 CFR Part 6, Appendix A

Preliminary State ARARs

- Florida Administrative Code (FAC), Chapter 17-3 (Water Quality Standards)
- FAC, Chapter **[62-302]** (Surface Waters of the State)
- FAC, Chapter **[62-302]** (Surface Water Quality Standards)
- FAC, Chapter 17-28.700 (Stormwater Discharges to Groundwater)
- FAC, Chapter 17-550 (Drinking Water Standards, Monitoring, and Reporting)

Screening Values (not listed as ARARs)

- EPA Region IV Waste Management Division Sediment Screening Values for Hazardous Waste Sites (2/16/94 Version).

- State of Florida Sediment Quality Assessment Guidelines (1/93 version)

3.2 Potential Contaminants and Sources

Numerous activities and industrial operations have been performed at NAS Pensacola leading to the production, handling, or disposal of hazardous materials and/or wastes. The 20 IR sites listed for investigation regarding possible contamination have been identified as possibly impacting 28 wetlands or wetland complexes. Known or suspected contaminants associated with the 20 Installation Restoration Program (IR) sites include metals, TRPHs, VOCs, BNAs, PAHs, PCBs, and phenols (E&E 1992a). Figure 3-1 illustrates the locations of the NAS Pensacola IR sites potentially impacting wetlands. Three general areas of contaminant discharge, along with the number of sites potentially contributing contaminants to each area, were identified in E&E's study:

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General Areas of Contaminant Discharge:

- Chevalier Field and vicinity, where 13 sites potentially affect 10 wetlands
- The Sanitary Landfill and vicinity, where four sites potentially affect 11 wetlands
- Forrest Sherman Field, where three sites potentially affect seven wetlands north and south of the airfield.

EPA has collected sediment and surface water samples within 10 wetlands at NAS Pensacola as part of its July 1992 field investigation. E/A&H has collected sediment and surface water samples within seven wetlands as part of RI related activities. Both of these investigations have shown elevated concentrations of metals, pesticides, and SVOCs likely associated with several IR sites. To date, general areas of contaminant discharge have correlated with areas identified by E&E.

Due to equipment malfunctions, some EPA sampling locations were not precisely identified. On the basis of the above, E/A&H has used the EPA data, where available, as a screening to better plan future sample locations shown in the Site 41 SAP. Tabulated EPA sample results are included as Appendix C. Specific sample locations and results of the EPA and E/A&H investigations are shown in the Site 41 SAP.

Wetland 13, adjacent to the wastewater treatment plant, was recently studied by Groundwater Technology Government Services, Inc. due to an accidental release of approximately 3,000 gallons of waste oil. The investigation was conducted under the auspices of the FDEP UST program. Based on the December 1994 Tier I Partnering Team meeting in Atlanta, all wetlands potentially impacted by a UST will be investigated under the UST program.

Table 3-1 describes the discharge locations, suspected contaminants, duration of discharge, and potential pathways for the 20 IR sites identified as possibly impacting the NAS Pensacola

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Table 3-1
Summary of Sources and Pathways of IR Site-Related Contamination at NAS Pensacola Potentially Impacting Site 41

Source (Site)	Site Name	Known or Suspected Contaminants	Years of Operation	Potential Pathway(s)	Specific Wetland(s)[a] Potentially Impacted
1	Sanitary Landfill	Metals, TRPHs, VOCs, PAHs, phenols	30 (1950-1980)	Groundwater, surface runoff	1-4, 15-18
3	Crash Crew Training Area	Metals, TRPHs, VOCs, PAHs, phenols	37 (1955-present)	Surface runoff into storm water drain	39, 52, 72, W1[b]
4	Army Rubble Disposal Area	Unknown	Unknown	Groundwater	52, 56-58
5	Borrow Pit	Unknown	Unknown	Groundwater, surface runoff	79
6	Fort Redoubt Rubble Disposal Area	Unknown	Unknown	Groundwater, surface runoff	79
9	Navy Yard Disposal Area	Metals, TRPHs, PAHs	13 (1917-1930s)	Groundwater, surface runoff	6-8
10	Commodore's Pond	Metals, TRPHs, PAHs, phenols	Unknown (1800s)	Groundwater, surface runoff	6-8
11	North Chevalier Disposal Area	Metals, TRPHs, VOCs, PAHs, phenols	Unknown (1930s-present)	Groundwater, surface runoff, direct discharge	7-8, 64
12	Scrap Bins	Metals, TRPHs, PAHs, phenols, PCBs	60 (early 1930s-present)	Stormwater drain	6-8, 64
13	Magazine Point Rubble Disposal Area	TRPHs, VOCs, PAHs, phenols[c]	Unknown	Groundwater	10
14	Dredge Spoil Fill Area	Metals, TRPHs, VOCs, PAHs, phenols	17 (1975-present)	Groundwater, stormwater overflow	63
16	Brush Disposal Area	Metals	Unknown (1960s-1973)	Groundwater, surface runoff	19
[19	**Fuel Farm Pipeline Leak Area**	**Metals, TRPHs, PAHs, VOCs**	**Single Incident (1958)**	**Groundwater, surface runoff**	**49, 52, 54**

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Table 3-1
Summary of Sources and Pathways of IR Site-Related Contamination at NAS Pensacola Potentially Impacting Site 41

Source (Site)	Site Name	Known or Suspected Contaminants	Years of Operation	Potential Pathway(s)	Specific Wetland(s)[a] Potentially Impacted
23	**Chevalier Field Pipeline Leak Area**	**Metals, TRPHs, PAHs, phenols**	**Two incidents (1965, 1970)**	**Groundwater, surface runoff**	**6-8]**
29	Soil South of Building 3460	Metals, TRPHs, PAHs, VOCs	Unknown (1970s-1980s)	Groundwater	6-8
30	Buildings 649 and 755	Metals, TRPHs, VOCs, PAHs, phenols	30 (1940s-1970s)	Groundwater, surface runoff, direct discharge	5-8
32,33,35	Industrial Wastewater Treatment Plant	Metals, VOCs, BNAs	11 + (1981-present)	Groundwater, surface runoff	7-13
34	Solvent North of Building 3557	Metals, TRPHs, PAHs, phenols	Single incident (1984)	Groundwater	6-8
36	Industrial Waste Sewer	Metals, TRPHs, VOCs, PAHs, phenols	21 + (1971-present)	Groundwater	5-13, 63
[37	**Sherman Field Area**	**Metals, TRPHs, VOCs, PAHs**	**Single Incident (1983)**	**Groundwater**	**48, 52, 54]**
39	Oak Grove Campground	TRPHs, VOCs	Unknown	Groundwater	56

Source: Ecology and Environment, Inc., 1992.

Notes:

[a] = Wetland number corresponds to U. S. Environmental Protection Agency (EPA) wetland inventory (Parsons and Pruitt 1991)
[b] = Wetlands not identified in EPA wetland inventory (Parsons and Pruitt 1991).
[c] = Suspected source of these contaminants is the Industrial Wastewater Treatment Plant (sites 32, 33, and 35).
TRPH = Total Recoverable Petroleum Hydrocarbons
PAH = Polyaromatic Hydrocarbons
VOCs = Volatile Organic Compounds
PCBs = Polychlorinated Biphenyls

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wetlands. Although sites addressed under the UST program will not be addressed during this investigation, UST-related contaminants detected in wetlands that may have mixed with contaminants from an IR site will be addressed as part of the RI for Site 41. The following is a discussion of the activities performed at each of these IR sites relating to the potential discharge of contaminants into certain wetlands.

Chevalier Field and Vicinity — Thirteen sites (9, 10, 11, 12, 13, 14, 29, 30, 32, 33, 34, 35, and 36) have been identified as potential sources of contaminants to Wetlands 5, 6, 7, 8, 10, 11, 12, 13, 63, and 64. Site 30 historically discharged metal-plating waste into Wetland 5 and is believed to be the single largest source of contaminants to this wetland complex. Samples from Wetlands 5, 6, and 7, to the west and north of Chevalier field, have shown elevated concentrations of metals, TRPHs, VOCs, PAHs, and phenols. Sediment samples collected in this wetland by EPA and E/A&H have shown contaminants possibly associated with these operations. Site 30 is currently undergoing an RI. A waste-receiving structure, since removed from Wetland 5, appeared to be one source of elevated levels of organic and inorganic contaminants that remain in the sediment and surface water. Sediment in Wetland 5 may be a source to downstream wetlands via the surface water drainage system, including Wetlands 6 through 8.

The Industrial Wastewater Treatment Plant (IWTP or OU10: Sites 32, 33 and 35) may also contribute contamination to Wetlands 7 and 8, as well as to Wetland complex 10-13, adjacent to the IWTP. An RI conducted at the IWTP in 1992 has shown volatiles, semivolatiles and metals present in the soil and groundwater. Similar contamination has also been confirmed in the sediment and surface water of adjacent Wetland 10. Wetlands 11 and 12 may also be subject to contamination from the IWTP via groundwater and/or surface runoff. Site 13, the Magazine Point Rubble Disposal Areas, may also be a contaminant source into these wetlands. (E/A&H, October 1994.)

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Site 36, the industrial waste sewer line, is approximately 1 mile wide by 5.5 miles long and runs along an approximately 1.25-mile section of Wetland 6. The flow direction of the sewer is towards the Industrial Wastewater Treatment Plant (IWTP), located due north of Chevalier Field. The most recent investigation at this site was focused near Chevalier Field where tetrachloroethylene and other volatiles are of concern. Wetland 6 may be impacted due to the activities at this site.

The Dredge Spoil Fill Area (Site 14) is a potential source of contamination to Wetland 63, which comprises two estuarine emergent wetlands located north and south of the fill area (Wetlands 63A and 63B). Phase I analytical results showed elevated TRPH concentrations in the sediment of Wetland 63A and 63B, respectively. Contaminated surface runoff and groundwater from Chevalier Field were initially identified as possible sources of this contamination (E&E 1992a). E/A&H has determined that although Site 14 is adjacent to both wetlands, is not expected to be a source of contamination to either Wetland 63A or Wetland 63B (E/A&H, May 1994). However, nearby Building 3380 is suspected of impacting Wetland 63A.

Other sites potentially impacting Wetlands 6 through 8 are included in this paragraph. Commodore's Pond (Site 10), and the Industrial Waste Sewer (Site 36) are potential sources of metals and TRPHs to Wetland 6. The North Chevalier Disposal Area (Site 11) surrounds Wetlands 7, 8, and 64, and is a potential source of multiple contaminants such as metals, TRPHs, VOCs, PAHs, and phenols to these three wetlands (E&E 1992a). An RI is currently being performed at Site 11. Groundwater migration, surface runoff, and direct discharge are potential pathways of contamination from Site 11. The Scrap Bins (Site 12) are also a potential source of numerous contaminants such as metals, TRPHs, PAHs, phenols and PCBs to Wetlands 6, 7, 8, and 64 via an onsite stormwater drain. Site 9 may be a contaminant source of unknown disposal material to Wetlands 6 through 8. Site 29 is due to a suspected leak in the

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industrial waste sewer which may have released solvents and other potential contaminants. Site 34 is due to a leak which reportedly resulted in the loss of 45,000 gallons of a solvent detergent containing 1.7 percent chlorinated aromatic hydrocarbon solvent (E&E 1992a).

Sanitary Landfill and Vicinity — Four sites in the area of the Sanitary Landfill (Site 1) are suspected of impacting 11 wetlands. Of the 11 wetlands initially identified near Site 1, eight (Wetlands 1 through 4 and 15 through 18) are possible receptors of contamination. Although enumerated in the EPA inventory, Wetland 14 is a sand pit and does not qualify as a wetland, according to Parsons and Pruitt (1991). EPA and E/A&H have sampled the sediment and surface water from eight wetlands surrounding Site 1. Contaminants detected in the sediment and surface water of these wetlands may need to be characterized further. Most of the detected contamination can be attributed to leachate migration from the landfill via discharge of contaminated groundwater.

The Brush Disposal Area (Site 16), has been identified as possibly impacting Wetland 19B or Wetland W2. Wetland 19B is an estuarine emergent wetland north of Site 16 which empties into Bayou Grande. Wetland W2, undesignated in EPA's wetland inventory done by Parsons and Pruitt, is palustrine emergent and flows north through Site 16 before draining into Bayou Grande. Although a Phase I contamination assessment has not been performed on Site 16, it is not expected to be a significant source of contamination to Wetland 19 or Wetland W2.

South of Site 16, Wetland 79 is a palustrine emergent wetland located adjacent to the Borrow Pit (Site 5) and within the Fort Redoubt Disposal Area (Site 6). Although Phase I contamination assessments have not been performed on these two sites, there is no historical evidence of

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hazardous waste disposal in these areas. Thus, these sites are not expected to be significant sources of contaminants to Wetland 79.

Sherman Field and Vicinity — Three sites located south of Sherman Field (Sites 3, 4 and 39) have been identified as potentially significant sources of contamination to seven wetlands or wetland complexes.

Site 3, the Crash Crew Training Area, is a potential source of contamination to wetlands north and south of Sherman Field via a stormwater drainage system, as well as to onsite wetlands. Based on the E/A&H technical memorandum at Site 3, emergent Wetland W1 in the drainage swale at Site 3 has shown contaminants in the sediment. Sediment samples were found to contain elevated levels of metals and SVOCs. Receiving wetlands downstream from the outfalls of the stormwater drainage system include Wetlands 39 and 72 to the north and Wetland 52 to the south (E/A&H, June 1994.) **[These wetlands will be investigated as part of the Site 41 investigation.]**

Site 4, the Army Rubble Disposal Area, may transport contaminants via groundwater into Wetlands 52, 56, 57 or 58, depending on the direction of groundwater flow. However, Site 4 is not a suspected significant source of contamination. (E&E, 1992a.)

Based on the E/A&H RI of Site 39, the Oak Grove Campground, it is not a likely source of contamination to its nearest wetland, Wetland 56. Contaminant levels in the surface soil and groundwater appeared relatively low and limited in extent. In addition, groundwater and surface water have been documented to flow away from Wetland 39 towards Pensacola Bay. (E/A&H, November 1994.)

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Other Potential Sites — Based on proximity to the wetlands and low to moderate concentrations of contaminants (identified as part of Phase I assessments), eight additional sites were identified as having a possible impact on the NAS Pensacola wetlands.

These sites include:

- Site 7 — Firefighting School Training Area
- Site 8 — Rifle Range Disposal Area
- Site 22 — Refueler Repair Shop
- Site 24 — Mixing Area
- Site 25 — Radium Spill Area (Preliminary Site Characterization currently underway)
- Site 26 — Supply Department Outside Storage Area
- Site 27 — Radium Dial Shop Sewer (RI currently underway)
- Site 31 — Soil North of Building 648 (combined with Site 30, RI currently underway)

The rationale for identifying these sites as having a possible impact on the NAS Pensacola wetlands and the locations of the sites is provided in Appendix D. Although these sites have been identified as possibly impacting wetlands, the potential impact of the above sites will be studied during the initial phase of the wetland investigation outlined in Section 4 and more extensively, if necessary.

3.3 Potential Contaminant Migration Pathways and Preliminary Public Health and Environmental Impacts

Since Site 41 is a conglomeration of diverse wetland areas which may have been affected by various NAS Pensacola activities, potential contamination migration pathways will be discussed regarding those IR sites possibly transporting pollutants to and from the wetlands. The NAS Pensacola wetlands consist of small wetland sites and large wetland complexes distributed

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throughout the NAS Pensacola peninsula. Many are incorporated into drainage areas distributing surface runoff north to Bayou Grande or south to the Intercoastal Waterway/Pensacola Bay. In the following discussion, organisms which reside in potentially contaminated NAS Pensacola wetlands are identified as the primary receptor of contaminants, while potential secondary receptors are identified as those organisms, including man, possibly affected by contaminants contained in the wetland areas as they migrate through the ecosystem and the food chain. Other potential receptors of contaminants from each of the 20 IR sites will be addressed in each site-specific investigation. This section will be general and will discuss secondary contaminant sources, primary and secondary release mechanisms, migration pathways, and receptors common to more than one primary source. The following analysis is conceptual in nature.

Figure 3-2 is a conceptual site model for the NAS Pensacola wetlands. For the purposes of this model, the organisms which reside in the possibly contaminated sediment and surface water of the NAS Pensacola wetlands are defined as the primary receptor of contaminants from the 20 IR sites. The primary release mechanisms associated with these IR sites are: (1) discharges to installation stormwater drains, (2) leakage from the industrial waste sewer system, (3) direct discharges into identified wetland areas, (4) groundwater migration/discharge and surface runoff, (5) sludge or fill material leachates, (6) landfill disposal leachates, and (7) miscellaneous petroleum product spills and/or leaks. Groundwater is affected through the infiltration and percolation of contaminants while facility surface waters and sediments are affected by overland stormwater runoff and groundwater discharge. As illustrated by the model, surface water and groundwater can pass through or migrate into the NAS Pensacola wetlands. Once received by the wetlands, contaminants may dissolve into the water column, adsorb onto suspended particulate matter in the water column, or accumulate in the sediments or organic debris of the impacted wetlands. Wetland surface waters and/or sediments can then become the primary source of contaminants.

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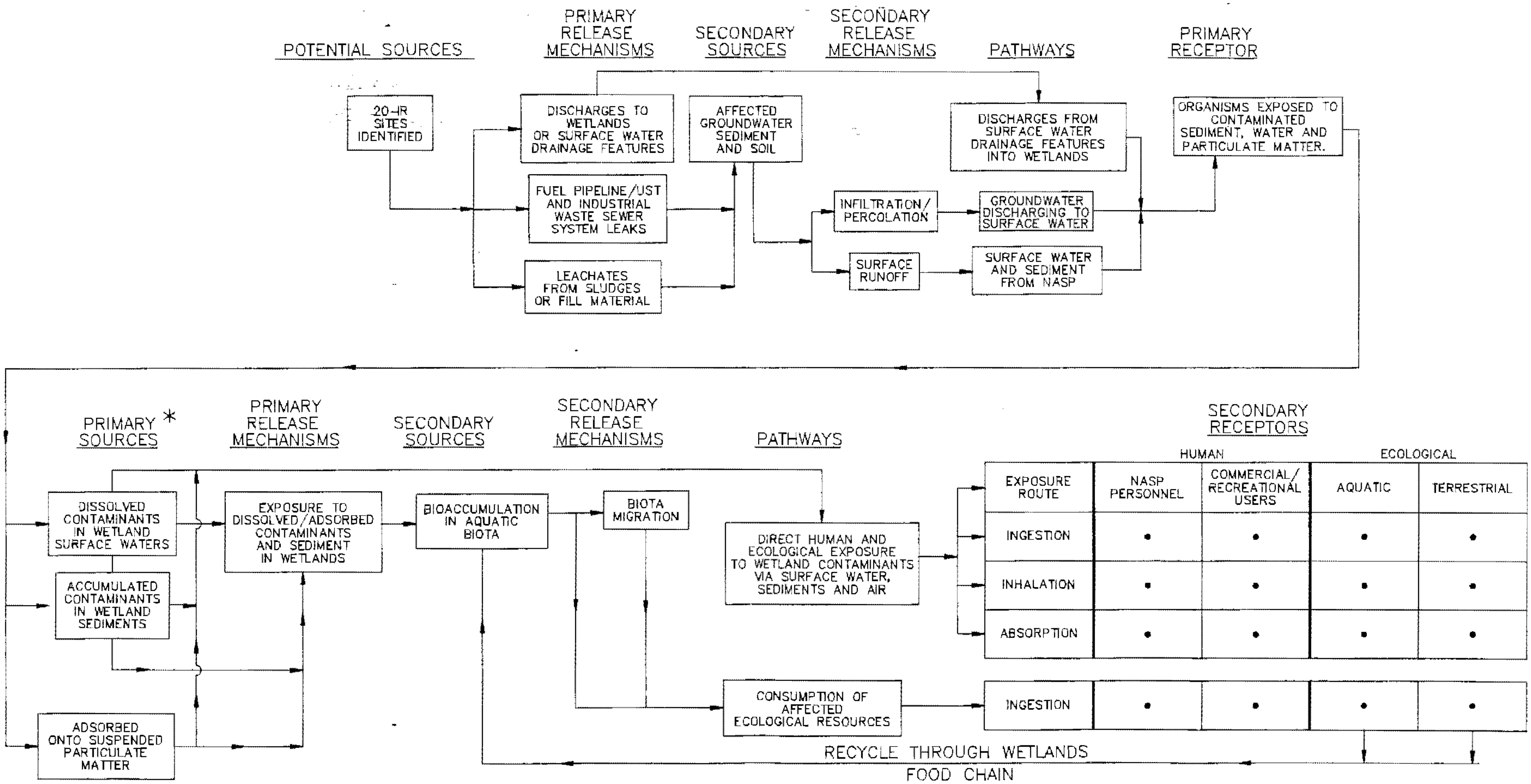

* CONTAMINANT CONCENTRATIONS AND MEDIA CHARACTERISTICS CAN DETERMINE WHETHER CONTAMINATED SEDIMENT ACTS AS A SOURCE OR PATHWAY OF CONTAMINATION

RI/FS WORK PLAN
SITE 41 NAS PENSACOLA
WETLANDS
PENSACOLA, FLORIDA

FIGURE 3-2
CONCEPTUAL SITE MODEL

DATE: 01/30/95 | DWG NAME: 36SCSM43

Bioaccumulation in secondary receptors occurs as aquatic and terrestrial biota of the various wetland and estuarine habitats are exposed to the contaminants. Exposed biota continue and often accelerate the transportation process through the food chain. Human contact with contamination occurs through direct exposure with associated waters and/or sediments, or the consumption of exposed biota (example: wetland gamefish, waterfowl or seafood from the bay/bayou). Meanwhile, the bioaccumulation process continues as exposed biota are consumed by other biota within the respective food chains.

An important concept in contaminant transport involves the role of the wetlands possibly becoming a secondary source of contamination. Typically, wetlands are considered part of the pathway of contaminant migration to exposed organisms. However, if contaminant concentrations are high enough, it is possible that contaminated sediment may become a source of contamination to the ecosystem through continued contaminant migration. If this occurs, it may be necessary to focus remedial activities on these sources; however, full assessment of fate and transport mechanisms will be evaluated prior to evaluating potential abatement alternatives. Figure 3-2 identifies this dual role that contaminated sediments and surface water can play as pathways and sources.

The above pathway information can be refined into the design of a more accurate sampling approach as data becomes available from the current investigations at several of the IR sites. The general procedure for accomplishing this objective is outlined in Section 4 of this work plan.

3.4 Remedial Objectives, Actions, and Alternatives

Remedial action will be addressed on a wetland by wetland basis, realizing that wetlands may be pathways, as well as sources of contamination. Strategies for remediation must be weighed in considering the overall damage possibly caused versus the damage caused by taking no action

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at all. This is particularly true if the wetlands become sources of contamination to physical and biological receptors within the wetland itself and downgradient of it. This strategy may also be influenced by issues such as compensation, practicality, remediation, taking no further action and other emerging issues in the field of ecological and human health risk assessment.

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4.0 WORK PLAN RATIONALE

The objective of the RI at Site 41 is to quantitatively characterize the actual or potential effects of contamination in NAS Pensacola wetlands in relation to human health and the environment. Through the authority established in CERCLA and other statutes, remedial actions selected for the NAS Pensacola wetlands must be sufficient to protect both human health and the environment. Information gathered from the RI will be incorporated into an ecological and human health risk assessment to quantify any current and future effects on each wetland.

Each wetland at NAS Pensacola is unique in nature and complexity. The protocol designed is uniform enough to characterize similar receptor endpoints at each wetland, yet flexible enough to vary sampling locations and parameters to reflect varying wetland conditions. Another important aspect of this approach is its adaptability to be cancelled after any phase of the investigation. This may save unnecessary time and expense if potential impacts can be adequately characterized before proceeding to the next level of effort.

Although each wetland at NAS Pensacola is unique, the procedures used to analyze them will be consistent with the Pensacola Bay and Bayou Grande investigations. The RI approach is divided into three phases. The first phase focuses on qualitatively reviewing each wetland and developing a sampling strategy for the Phase II investigation. Phase II involves collecting specific quantitative chemical data from each wetland to complement the qualitative data from Phase I. Phase III is planned in case there are any other important data needs after Phase II is completed.

Information from all phases will be incorporated into an ecological and human health risk assessment at each wetland, which is a measure or estimation of current and future effects on the ecosystem and human health. Figure 4-1 is a flowchart outlining the RI process.

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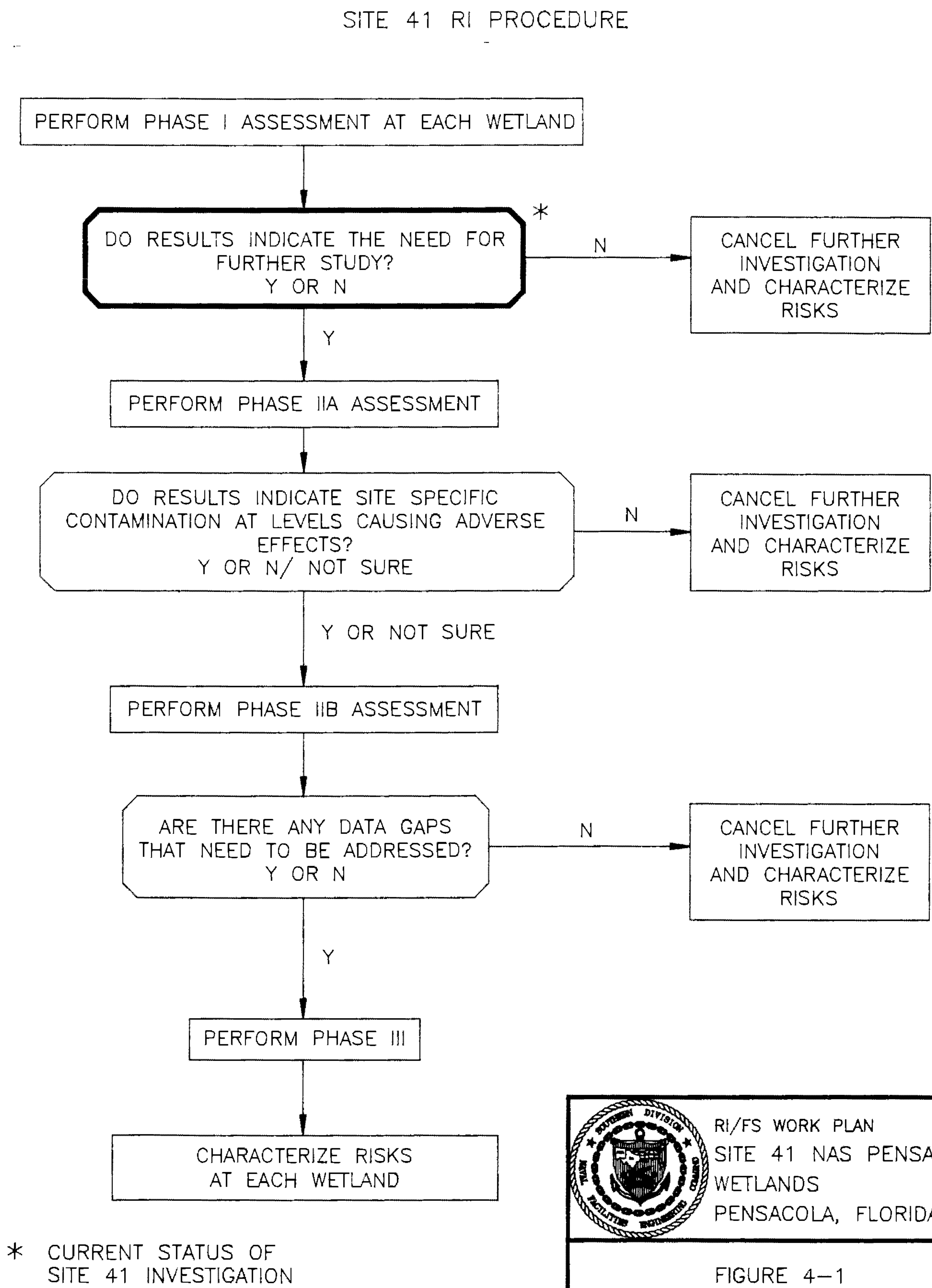

RI/FS WORK PLAN
SITE 41 NAS PENSACOLA
WETLANDS
PENSACOLA, FLORIDA

FIGURE 4–1
REMEDIAL INVESTIGATION
PROCEDURE FLOWCHART

DWG DATE: 01/31/95 | DWG NAME: 36RIPF2

4.1 Work Plan Organization

This Site 41 work plan is organized according to the three phases of the Site 41 RI. The data gathering method for each phase of the assessment will be described, followed by a discussion of the data objectives to be achieved from each phase. Wetlands requiring further study after Phase I and their proposed sample locations will be described in the Site 41 SAP.

There may be significant time lapses between each phase of this investigation for laboratory analysis, data validation, and sample strategy development. However, every effort will be made to perform each phase of field work within the same seasonal time frame to reduce the influence of seasonal variations that might affect sample results. After the submission of the Site 41 SAP, which will summarize Phase I and outline the Phase IIA sampling approach, subsequent phases of the investigation will be outlined in a technical memorandum, showing sample locations and parameters of analyses.

4.2 Phase I

Phase I is primarily a qualitative review of any information needed in part help determine sample locations for Phase IIA of the investigation. Two principal objectives are to be met during Phase I: (1) Identify and justify all sediment and surface water samples required in the initial Phase IIA sampling and (2) Describe the framework of the human health and ecological risk assessment. Phase I includes a review of sample results from IR sites, including data already collected in some of the wetlands. In addition, information on IR site-related activities, possible contaminants of concern and information on receptor species will also be reviewed.

Information from Phase I will be incorporated into Phase IIA. The goal of Phase IIA is to characterize the nature and extent of contamination in all wetlands of concern. This may require more than one round of sampling to determine this. After Phase IIA, Phase IIB may be performed. Phase IIB involves the use of diversity studies and toxicity tests to quantify impact

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occurring in particular areas of a wetland. If additional data is required after Phase IIB, Phase III may be implemented to determine possible contaminant bioaccumulation in the food chain. Specific tasks to be conducted during Phase I are described below.

4.2.1 Phase I — Habitat and Biota Survey

Phase I, the habitat and biota survey, is a qualitative survey of each wetland. Its purpose is to identify basic biological characteristics of each wetland and how they may relate to contamination. Results from Phase I will also be used to develop a sampling strategy for Phase II of the RI. Phase I data will be used with the results from Phase II analyses to provide an integrated study. Because there is no standard method for conducting the habitat and biota survey, the general methods outlined in Section 8.3 of *Ecological Assessment of Hazardous Waste Sites, A Field and Laboratory Reference* (EPA 1989) will be used. Specific approaches can vary based on habitat type, size, and diversity. Other aspects of Phase I are described below.

The habitat and biota survey will begin with a review of all relevant data from NAS Pensacola and the general area, including information from previous investigations, topographic maps, aerial photographs, and any other information about each wetland and its history. This information will be used primarily to determine sources of potential contamination and potential wetland receptors of concern.

E/A&H is currently performing RI investigations throughout NAS Pensacola and has collected samples within some of the wetlands as part of those investigations. There have also been other studies performed within the NAS Pensacola wetlands by the EPA and E&E. With the exception of the **[chemical data from the]** E&E studies, data from these investigations may be used to replace data planned to be collected as part of the RI at a particular wetland. Previous data will

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be screened against sediment screening values and surface water quality standards as an initial assessment of contaminant impact.

4.2.2 Phase I Contaminant Source Survey

Information from the habitat and biota survey will be used to produce a contaminant source survey of each potential wetland of concern. The contaminant source survey will be conducted to determine any potential contaminant sources and any present or past waste streams from any IR site. The survey will include a review of previous investigative reports, interviews with present and former NAS Pensacola personnel, aerial photo analysis and a utility survey.

The survey will include the identification of the following:

- Past and present chemicals used at an IR site.
- Locations of any known surface spills.
- Locations of any known historical outfalls.
- Locations and contents of any known present or former underground storage tanks.

4.2.3 Phase I Site Reconnaissance

After all relevant data about each wetland of concern has been reviewed, each wetland will be visited and inspected to conclude the habitat and biota survey and the contaminant source survey. Although personnel will be familiar with each wetland habitat through previous investigations, a qualified ecologist who is experienced in assessment procedures and familiar with the flora and fauna of the Pensacola area will accompany personnel on the initial visit to NAS Pensacola. Effects on the wetland ecosystem by any site-specific contamination can be estimated by noting any anomalous features such as changes in vegetation patterns, unusual odors, colors, or stains. During the Phase I data review or site visit, a wetland may be declared unimpacted based on the location of the wetland relative to known IR sites, the results of previous studies, or direct

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observations made by a qualified ecologist. For such wetlands, further investigation may be unnecessary, but the wetland can be categorized as a reference area for future comparative studies.

Reference wetlands, which will also be identified as a basis for comparison to potentially impacted wetlands, will be chosen. These wetlands will be on base and similar in vegetation, topography, geology, and hydrology to the wetlands potentially impacted by an IR site. The wetlands should have no apparent impacts from any IR site or other sources of contamination based on field observations and a historical study of the reference wetland. These reference wetlands and their sample locations will be described in the Site 41 SAP.

All reference wetlands and wetlands of concern will be characterized based on the *Corps of Engineers Wetland Delineation Manual* (USACE 1987). Instead of emphasizing a jurisdictional delineation, E/A&H will focus on adequately characterizing the wetlands to develop an accurate sampling approach. See Section 8.5 of the CSAP, outlines the general procedures to be followed when characterizing a wetland.

4.2.4 Endpoint Determinations

Measurement and assessment endpoints, ecologically based criteria that are relevant to decisions made about protecting the environment, must also be determined. Measurement and assessment endpoints may involve ecological components from any level of biological organization, ranging from individual organisms to the ecosystem itself. In general, the use of a suite of measurement and assessment endpoints at different levels of biological organization can build greater confidence in the conclusions of the risk assessment and ensure that all important endpoints are evaluated. Measurement endpoints are defined as measurable responses to a stressor that can be related to the valued characteristics chosen as the assessment endpoints. Measurement endpoints are related to assessment endpoints using the logical structure presented in the

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conceptual model shown on Figure 3-2. The measurement endpoint should be related to the assessment endpoint when the assessment endpoint cannot be measured. For example, if a higher food chain predator cannot be measured for its bioaccumulation of a particular contaminant, then measuring bioaccumulation in a lower food chain prey species would be an appropriate measurement endpoint.

Assessment endpoints allow for the prediction or measure of explicit expressions of environmental values to be protected. Assessment endpoints are the ultimate focus of risk characterization, and link the measurement endpoints with the risk management process. An assessment endpoint should be affected by exposure to a stressor and be sensitive to the specific type of effects caused by the stressor. For example, if a chemical is known to bioaccumulate and is suspected of causing eggshell thinning, an appropriate assessment endpoint might be raptor population viability. In some cases, quantitative methods and models are available to link measurement and assessment endpoints, but often the relationship can be described only qualitatively. Because of the lack of standard methods for many of these analyses, professional judgment is an essential component of the evaluation and often must be used to clearly explain the rationale for analysis and assumptions.

4.2.5 Conceptual Model Development

Information from endpoint selection will be incorporated into the conceptual model, which is a series of working hypotheses regarding how the stressor might affect ecological components. The conceptual model is based on Figure 3-2 and describes the ecosystem potentially at risk and the relationship between measurement and assessment endpoints.

During conceptual model development, a preliminary analysis of the ecosystem, stressor characteristics, and potential effects is used to define possible exposure scenarios. For chemical stressors, the most common stressor associated with an IR site, the exposure scenario usually

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involves consideration of sources, environmental transport, partitioning of the chemical among various environmental media, chemical or biological transformation or speciation, and identification of potential routes of exposure. In addition, other physical stressors may be present which are not be related to activities at an associated IR site. These stressors must also be recognized during the investigation as possibly contributing to ecological risk.

Although many hypotheses may be formulated, only those considered most likely to contribute to risk are selected for further evaluation. For these hypotheses, the conceptual model describes the approach that can be used for the analysis phase and the types of data and analytical tools that may be needed when uncertainty is addressed in risk characterization. It is important to acknowledge hypotheses that are not carried forward in the risk assessment because of data gaps and other sources of uncertainty. Professional judgment is needed to select the most appropriate risk hypothesis, and it is important to document the selection rationale.

4.2.6 Sampling Strategy

Towards the end of Phase I, it will be possible to prioritize and accurately establish sampling locations for each wetland, which will be identified in the Site 41 SAP. The actual sampling will be performed in Phase II. However, evaluation of a wetland for Phase II sampling depends on a complete and thorough Phase I investigation. Therefore, it is important to plan the sampling strategy during Phase I.

The initial Phase IIA sampling locations at each wetland will involve areas where contaminants are thought most likely to accumulate, which are also known as *hot spots*. These areas will be primarily based on downgradient surface features, drainage patterns, and other locations where contaminants are most likely to be located. If the hot spot samples exceed two times mean reference values (determined through a reference wetland comparison), or the applicable surface

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water quality criteria or sediment screening value, then those areas *may* be sampled further, with the goal of better characterizing the extent of contamination.

This expanded sampling in Phase IIA may involve biased sample locations in areas surrounding any contaminated hot spots. Sample locations will be based on concentrations of contaminants or possible migration routes most likely to characterize the extent of contamination. If hot spot sampling during Phase IIA does not indicate site-specific or man-induced impact, the investigation may stop within that wetland.

This approach increases the efficiency and cost effectiveness of the investigation in two ways: (1) Sampling can be cancelled after only a few selected sampling locations, and (2) if hot spot analysis identifies the need for further sampling, subsequent sampling can be targeted for the contaminant(s) of concern.

4.2.7 Phase I Data Objectives

There are several methods that can be used to perform Phase I. Each method and related objectives are listed below.

Site History Data Objectives

- Determine when and what activities were occurring which may have impacted the wetland.
- Determine what changes may have been made to the wetland as a result of human activities.
- Determine what compounds may have been disposed of in and around the wetland.

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Resources such as aerial photographs, topographic maps, records of disposal actions, people familiar with the history of the IR site or its associated wetland, and any other relevant information can be used to achieve the above objectives.

Contaminant Release, Migration, and Fate Data Objectives

- Determine what compounds have already been shown to be present in the environment.

- Determine where groundwater is discharging to surface water or wetlands and in what direction it is flowing.

- Determine the direction in which surface water is migrating.

- Determine the location of outfalls or other potential point sources of contamination.

- Determine key receptors of contamination.

Data from previous sampling investigations, groundwater contour and topographic maps, species of concern listings, etc., can be used to achieve these objectives.

Reference Wetland Establishment Data Objectives

- Determine which wetlands to use as a control for the wetland of concern based on biological, chemical, and physical characteristics.

A site visit to all potential reference wetlands is necessary to determine the best reference wetland. The person(s) conducting the site visit will be familiar with the flora and fauna of the Pensacola area.

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Sampling Strategy Data Objectives

- Recommend measurement and assessment endpoints requiring further study.

- Characterize wetland and its boundaries and estimate the locations of hot spots and the number of samples required.

- Plan for possible additional sample locations to better characterize the extent of contamination.

4.3 Phase II — Chemical, Diversity and Toxicity Sampling

Phase II sampling is required to establish a link between any observed effects and possible contamination noted in Phase I. Phase IIA includes sampling for chemical constituents only. The main objective in Phase IIA is to better characterize the nature and extent of contamination in wetlands of concern. However, through the use of models and analytical methods described in this section, the potential for impact may also be determined after Phase IIA. If the results of Phase IIA can be used to determine the impact at a wetland, the investigation can end at this phase. However, if questions remain about impact, Phase IIB diversity studies and toxicity tests may be implemented to refine estimations of impacts occurring within each wetland.

4.3.1 Phase IIA Chemical Parameters

Selected sediment and surface water sample locations within each wetland and its reference wetland will initially be sampled for the presence of contaminants using full TCL/TAL. TCL/TAL is defined as all analytical parameters associated with the Contract Laboratory Program (CLP) parameters based on the CLP statement of work (SOW) for organic and inorganic analysis.

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These samples will first be collected from potential hot spots identified during Phase I. Once these samples are analyzed, contaminant concentrations can be compared to those from reference wetlands, sediment screening values, and water quality criteria. Results of the comparison will help determine the likelihood of site-specific impact and the need to perform expanded sampling. If benchmark values do not exist for a contaminant, bioaccumulation modeling in the food chain, **[literature searches,]** or other methods may be used to estimate the potential impact. If bioaccumulation values can be predicted, it may be possible to calculate endpoints such as the LD_{50}— the administered dose or environmental concentration where 50 percent of the experimental organisms die in a specified period of exposure time. However, if contaminant levels or modeling leave doubt about the potential environmental impacts from a particular IR site, then the Phase IIB portion of the investigation may be necessary.

Sediment samples may be collected using either a hand auger or Petite Ponar dredge in accordance with the procedures outlined in Sections 4 and 7 of the CSAP. Surface water samples can be collected in accordance with Section 7 of the CSAP either by placing the sample bottle in the surface water or by using a Kemmerer sampling device (depending on the depth to the sediment). In tidal wetlands, attempts will be made to sample surface water during low tide to capture the maximum amount of contaminants leaching, migrating via surface water runoff, or migrating via shallow groundwater from the IR site of concern.

To associate groundwater contamination with a particular IR site, it may be necessary to install shallow monitoring wells, piezometers, rain gauges, or staff gauges around particular wetlands and IR sites of concern. Data from these monitoring tools can be used to help determine remedial strategies for the wetland and its associated terrestrial IR site. All monitoring wells will be installed and sampled according to Sections 5 and 6 of the CSAP. Installation of staff gauges, rain gauges and piezometers is described in Section 4 of the Site 41 SAP. The number and locations of monitoring wells at each wetland are not known at this point. However,

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justification for placement and locations of monitoring wells will be detailed when and if they are planned to be installed.

4.3.2 Evaluating Contaminant Levels

Once results from Phase IIA hot spot sampling are analyzed, two fundamental questions must be answered: (1) Are the compounds detected site-specific or man-induced, or are they within reference levels? (2) If the compounds are site-related or man-induced, are they at a concentration to cause adverse effects? The following method relies on several studies from various agencies to answer these two questions. This procedure is a compilation of guidance written by the State of Florida, the EPA, and other resource trustees. Like other procedures in this document, it follows a format, with each step of the procedure determining whether to proceed into the next level of detail. It is also specific for particular media and classes of compounds, each unique in its fate and transport. The flowchart outlining this procedure is shown in Figure 4-2.

Because of the many factors that affect how a contaminant behaves in the sediment and surface water, professional judgement is important when evaluating contaminant levels and their possible impacts. E/A&H plans to use a weight-of-evidence approach when assessing contaminant levels. Weight-of-evidence refers to evaluating all possible factors that govern the influences of a particular contaminant in the surface water or sediment. Some of these factors are explained in the remainder of this section.

Note from Figure 4-2 that the procedure described below is initially performed for those samples collected during hot-spot sampling. If hot-spot samples show contaminants above two times mean reference values and a particular benchmark, expanded sampling may be required. Once an area of sediment and surface water contamination that exceeds either two times mean reference values or a benchmark has been characterized, the investigation can move into

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PHASE IIA CHEMICAL SAMPLING

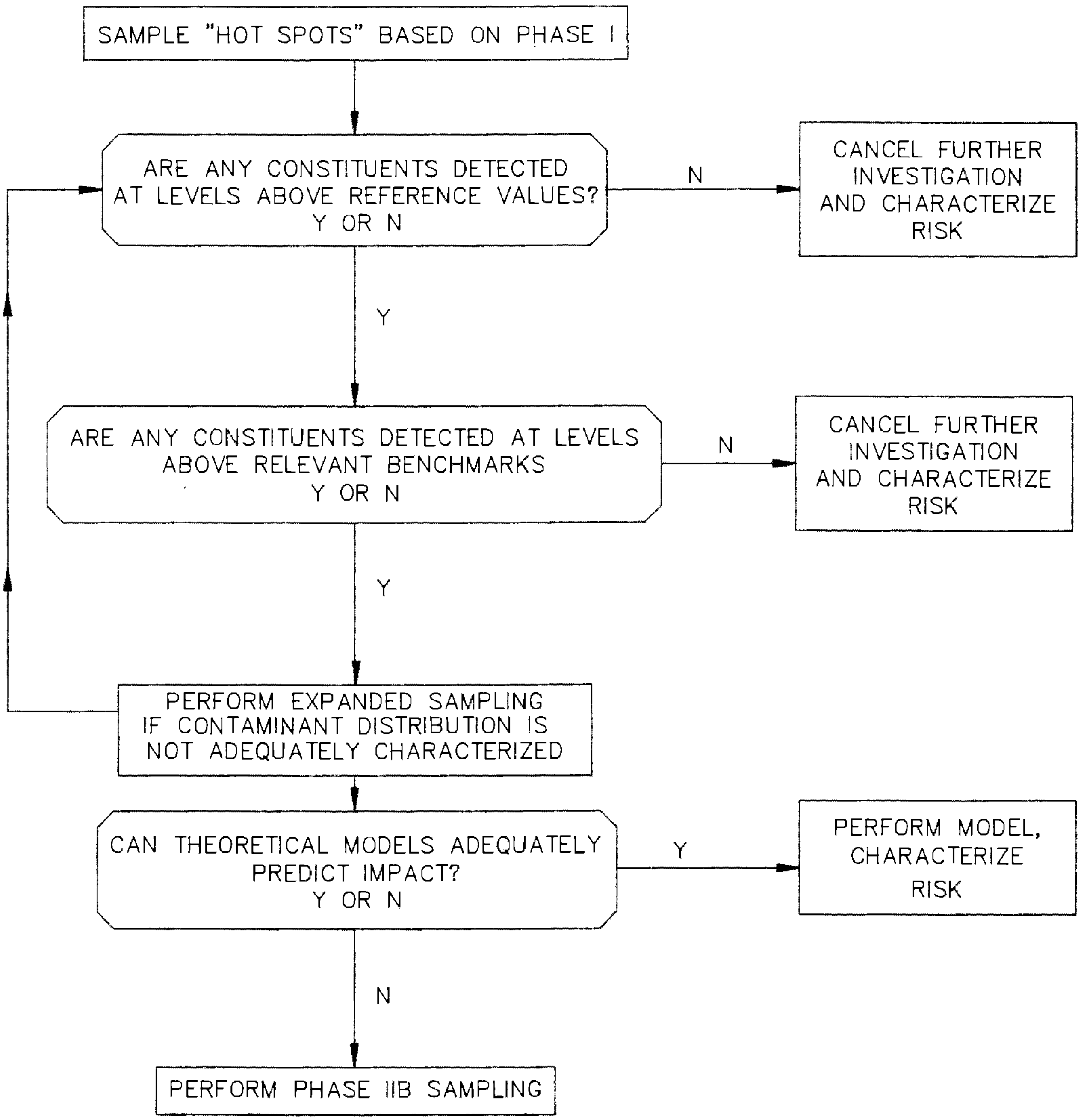

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FIGURE 4-2
PHASE IIA RI
PROCEDURE FLOWCHART

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Phase IIB, if necessary. Any sites having values below a benchmark may still be studied further, particularly if contaminants in the substrate are markedly bioavailable.

Reference Levels Comparison — The initial step is to determine whether constituents within the surface water or sediment have resulted from man-induced site-specific impacts or occur throughout the area based on natural influences. This determination is made by comparing the wetland of concern to its reference wetland. If it is determined that any constituents within that wetland are within two times the mean reference concentration, the wetland will not be considered to be impacted by its associated IR site. There may be cases where the constituents are present at levels above those considered to be within acceptable guidelines, but are below two times mean reference concentrations. Once considered below these reference levels, that particular constituent will not be studied further.

For sediments only, there is another method to determine the source of any heavy metals to be used in support of determining reference concentrations. This method, as outlined in *A Guide to the Interpretation of Metal Concentrations in Estuarine Sediments* (FDER 1988), states that naturally occurring aluminum is found within a certain proportion to other heavy metals found in Florida coastal sediments. By normalizing all metals detected in sediment to the aluminum concentration in that sediment, any metals occurring above this predicted proportion are considered to have resulted from human influences. Heavy metals occurring within this proportion are considered to represent natural background conditions. Although this method incorporates studies from many areas within Florida, it is not applicable to all situations. There may be site-specific instances of man induced elevated aluminum concentrations. However, since this procedure was written and endorsed by the State of Florida, it will be considered a useful tool in determining the potential presence of heavy metal contamination. **[The State of Florida uses a total digestion technique when analyzing their sediment samples. This digestion approach differs from the EPA Contract Laboratory Program. To evaluate the**

differences in sample results that may exist with these methods, 5% of the sediment samples collected in the wetlands will be duplicated and analyzed using the total digestion technique.]

If it is determined that the suspected surface water or sediment constituents are naturally occurring or within two times mean reference values and the above method, the investigation will terminate at this stage. If contaminants are shown to be greater than two times the mean reference values, no matter what their source, **[it must be determined whether the contaminants are causing, or can potentially cause, an adverse effect]**. This in part depends on the contaminant concentrations in comparison to the effects levels described below.

Ecological Effects Levels — If contaminant concentrations are identified as above two times mean reference values, they must be shown to cause or potentially cause an adverse effect. There are several approaches used to determine this, which often vary with the class of compounds to be analyzed. These methods have been integrated to produce a scientifically valid approach to estimate the extent of impact and determine the need for further investigation. This method is outlined as it pertains to surface water and sediment. Again, professional judgment is required when evaluating effects values. Contaminant concentrations must be compared to other environmental influences as part of the weight-of-evidence approach.

Surface Water — The EPA and the State of Florida have developed separate surface water criteria for the protection of aquatic organisms. There are several different benchmarks for each compound, including acute and chronic values. If a contaminant in surface water exceeds the lowest applicable benchmark, further study may be required. However, it is recognized that some of these values are dependent on pH, temperature, and other factors. These will have to be considered in determining the potential for adverse effects within the surface water.

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Sediment — The EPA and the State of Florida have developed sediment screening values which may be used as an initial screening after Phase IIA. However, is should be recognized that the applicablilty of these screening values is influenced by total organic carbon, grain size, and other site-specific influences. The shortcoming of this approach is that these benchmarks exist for a limited number of compounds. Several contaminants may be detected that may not have a benchmark. In these situations, biological effects levels may be determined using sediment partitioning values. This approach is usually applicable only to those contaminants which are non-ionic organic compounds. It is based on surface water quality standards and the equilibrium coefficient (K_{oc}) between the sediment and sediment pore water. It uses a predictive equation to determine safe contaminant concentrations in the sediment based on water quality criteria final chronic values. The model assumes that contaminant concentrations in the pore water can be directly correlated with concentrations in the sediment based on equilibrium partitioning. However, K_{oc} values are not known for every potential contaminant that may be found in the sediment. The EPA has recently started a project to determine acceptable sediment quality criteria using this method. However, as of this writing, the project has only addressed five compounds of concern. Until the EPA addresses other compounds, the K_{oc} values that are published in the current literature can be used to supplement data for contaminants published by EPA.

Data Gaps — Much of the information needed to determine acceptable concentrations of a given constituent within the surface water and sediment does not exist or may not be reliable. In these situations, other methods such as modeling techniques can be used.

Mathematical models include the Thermodynamic Bioaccumulation Potential developed by the USACE (USACE 1991). These models incorporate variables such as contaminants and their chemical properties and physical and chemical characteristics of the surrounding environment to predict contaminant bioaccumulation in the food chain. Whenever possible, a model will be

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used with the available chemical data rather than undertaking additional investigation to estimate the bioaccumulation of certain contaminants.

The goal of Phase IIA is to characterize where adverse effects are occurring in the wetlands of concern based on contaminant level benchmarks and modeling techniques. The phased approach described is a very efficient and cost effective manner to determine this. The investigation will end if site-related contamination is not identified at selected hot spots. However, if site-related impacts are noted, the investigation may continue with expanded sampling. Once expanded sampling has better characterized the extent of contamination and shown which areas have a potential for adverse impacts, the investigation may move into Phase IIB.

4.3.3 Phase IIA Data Objectives

The information below will be viewed in relation site history, the site visit, and the reference wetlands identified during Phase I. Results may be compared with benchmarks and contaminant modeling to determine ecological and human health impact. Based on these results, a site-by-site decision can be made to either cancel further study or perform diversity studies and toxicity tests in Phase IIB to better characterize the effects occurring at a wetland.

Sediment Chemistry Data Objectives

- Characterize the nature, magnitude, and extent of sediment contamination in the NAS Pensacola wetlands and reference wetlands using hot spot or expanded sampling techniques.

- To provide sufficient data to either adequately characterize or predict effects or determine the need for further testing.

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Surface Water Chemistry Data Objectives

- To characterize the nature, magnitude, and extent of contamination within the surface water of the NAS Pensacola wetlands.

- To provide sufficient data to adequately characterize or predict the effects on the ecosystem or establish the need for further testing.

4.3.4 Phase IIB

Phase IIB uses diversity studies and toxicity tests to quantify impact in particular areas of the wetlands of concern. Descriptions of both approaches and the data objectives are described below.

Phase IIB Diversity Studies — When necessary, species diversity studies can be performed within the sediments of each wetland of interest and a corresponding reference wetland. Benthic macroinvertebrates can be used for analysis because they are relatively stationary and serve as continuous monitors of the ecological health of a wetland. Samples will be collected from the upper 6 inches of the sediment using a Petite Ponar Dredge or stainless steel spoon or scoop. All samples will have a uniform and consistent amount of substrate sampled to achieve an accurate comparison. Diversity studies will not be performed on the organisms within the surface water because of the high degree of variability of these organisms based on factors such as precipitation, tides, and other non-site related factors. The results of the diversity studies will be analyzed to determine if there is a statistical difference in benthic macroinvertebrate diversity between the reference area and the wetland of concern. This may be done using analysis of variance (ANOVA) to test the hypothesis that mean species diversity and richness is not different from the reference locations when compared to potentially impacted wetlands. Other statistical correlations may also be used if additional information is needed to establish diversity trends.

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It is recognized that there are many factors which can influence the diversity of benthic macroinvertebrates in wetlands, such as substrate composition, tidal influence, temperature, and many other factors not related to effects from an IR site. In making diversity comparisons to reference locations, these other possible factors must be considered when evaluating trends in species diversity. ANOVA and other approaches can be used to help determine what factors are most important in influencing species diversity. If it is not clear what factors may be contributing to trends in species diversity, more emphasis will be placed on the Phase IIB toxicity tests described below.

Phase IIB Toxicity Tests — Toxicity tests can be used to establish a quantitative link between the diversity studies and any toxicological effects on any organisms. Toxicity tests measure the effect of contaminated media on the survival, growth, or reproduction of aquatic and terrestrial organisms. These tests provide an integrated index of the of the bioavailable toxic contaminants at each wetland. Selected test organisms are chosen based on their wide acceptance in laboratory analysis and the wealth of information available about their behavior. The use of either sediment or surface water toxicity tests depends on the type of contaminants suspected in the area sampled and the amount of available surface water. Samples for diversity studies and toxicity testing will be collected from the same sample locations as samples collected for chemical parameters. Both acute and chronic toxicity tests may be performed. Results from the wetland of concern may be compared with the reference wetland. Samples will be collected according to procedures outlined in Section 4 and 7 of the CSAP. Section 8.2.4 of the CSAP outlines the organisms planned to be analyzed within each substrate and the types of tests possibly run. Figure 4-3 shows a flow chart of the procedures to be performed during Phase IIB toxicity testing.

4.3.5 Phase IIB Data Objectives

Data from Phase IIB will be used to establish a link with the chemical analyses performed in Phase IIA.

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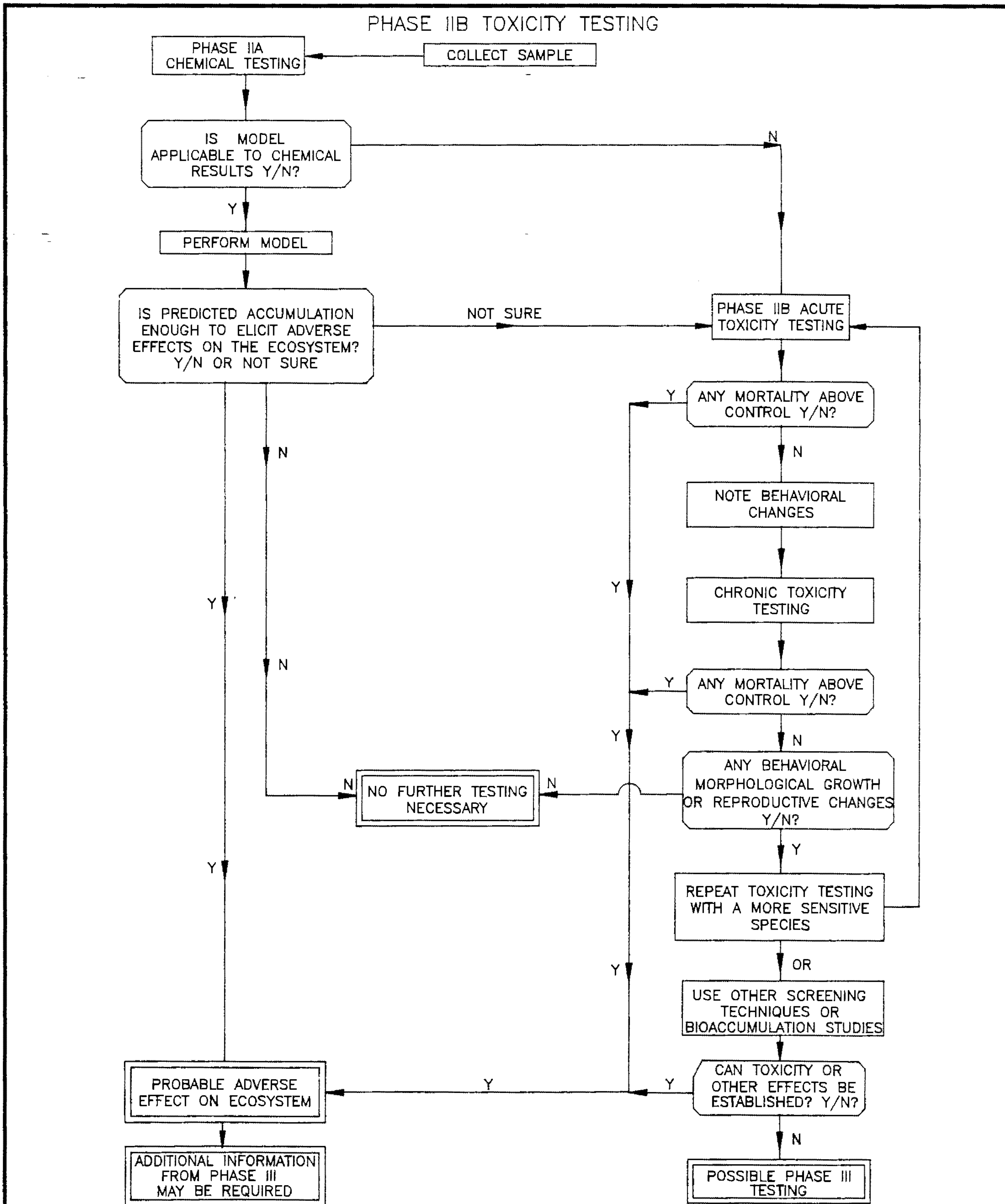

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FIGURE 4–3
PHASE IIB TOXICITY TESTING
FLOWCHART

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Diversity Study Data Objectives

- To characterize the biological community.

- To assess the effects of contaminants on the assemblage, distribution, and diversity of the biotic community compared to a reference area.

Toxicity Test Data Objectives

- To assess the toxicity of the contaminants present in the sediment and surface water of the wetlands.

- To determine the potential effects of contaminants in select organisms.

After this phase is completed, the impact occurring within a particular wetland may be adequately characterized. If there are any data gaps remaining or more in depth studies needed (see Figure 4-3), then the investigation may move into Phase III.

4.4 Phase III — Assessment of Bioaccumulation

Phase III of the RI involves a more refined determination of whether contaminated media are either toxic to organisms or bioaccumulating in the food chain. Phase III tests may be performed if further information is needed to gauge the impact occurring within a wetland or if Phases I and II do not yield sufficient information.

The test organisms selected for Phase III assessments may vary from wetland to wetland, depending on the types of higher trophic level organisms living in and around the particular area in question. The selected organisms may be identified during the Phase IIB diversity studies. Specific procedures for sampling and testing individual organisms may vary but will be in accordance with established EPA and ASTM guidelines. Appropriate organisms, sampling

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methods, and test organisms may be selected based on the results of the previous studies and consultations with the contracted laboratory.

The additional toxicity testing in Phase III may be performed to determine acute endpoints such as LD_{50}— the administered dose or environmental concentration where 50 percent of the experimental organisms die in a specified period of exposure time. In selecting test organisms, emphasis will be placed on organisms which are lower in the food chain, inhabit the suspected contaminated media of the particular area in question, and are relatively immobile. The percent lipid content of these organisms must also be available to model contaminant uptake. Information on lipid content may be available in the literature. Among the species to be considered are sessile filter feeders such as clams and oysters. Earthworms, various larval midges, fathead minnows, guppies, and other fish or terrestrial species might also be used.

Laboratory controlled, direct-exposure bioaccumulation studies on laboratory cultured organisms and/or the in-situ sampling of various resident biota may be required to firmly assess the potential impact from an IR site on a wetland. Both methods may include analysis for confirmed contaminants. Results of the bioaccumulation analyses can determine if these contaminants are bioaccumulating in the test organisms and whether or not higher trophic level animals feeding on such organisms could be adversely affected. If both measures of bioaccumulation are implemented, the comparison of bioaccumulation in laboratory cultured organisms to indigenous organisms could assess the influence of natural conditions on the rate and degree of contaminant uptake.

4.4.1 Phase III — Data Objectives

- To provide more refined assessment of contaminant toxicity or bioaccumulation.

- To provide specific ecological endpoints such as LD_{50}, chronic endpoints, or bioaccumulation values.

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4.5 Risk Assessment

After all relevant wetland data have been assimilated, ecological and human health risk can be characterized. The ecological aspect of risk assessment has not yet evolved to where standard risk calculations can be made as in human health risk assessments. There is much more professional judgement involved. The principal goal of the risk assessment at the wetlands is to quantify any adverse effects to human health and the environment result of any IR site-associated contamination.

Important issues to be addressed include the assessment of exposure versus the ecological or human health effects observed or predicted and their type, extent, and severity. As a conclusion, risks and uncertainties should be summarized and interpreted.

[4.6 Risk Management]

The potential for natural recovery should also be addressed to help base decisions for remedial action and mitigation. While sources of contamination might lend themselves to remediation, remedial efforts within wetlands must be carefully considered. Remediation in the wetlands may be considered if the wetlands become sources of contamination instead of pathways, or if the contaminants present in certain wetlands are determined to pose an unacceptable risk to human health and the environment. Since wetlands are considered to be assets, any remedial approach selected will consider how the approach might cause damage or further harm to the wetland and surrounding environment.

4.7 Laboratory Analysis

Laboratory analysis will be performed at DQO Level IV for all sediment and surface water samples collected for TCL/TAL in accordance with Section 10 of the CSAP. Laboratory analysis does not apply to the diversity studies or the toxicity tests. However, laboratories performing these tests will be approved by the State of Florida. Species diversity samples will be submitted to the selected laboratory for identification to at least the genus level. Field parameters will be collected at DQO Level II.

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5.0 SAMPLE COLLECTION PROCEDURES AND TASKS

This section summarizes the specific parameters and locations of samples to be collected during the RI/FS to fulfill the data objectives listed in the previous section and provide the necessary data for the ecological and human health risk assessment and feasibility study. All of the tasks will be conducted in accordance with the 1991 EPA Region IV SOP/QAM and the CSAP. This information is detailed in Section 4 of the Site 41 SAP.

5.1 Phase IIA — Chemical Sampling

Sediment samples will be collected using a stainless steel hand auger or a Petite Ponar Dredge as outlined in Sections 4.4 or 7.2 of the CSAP. If both surface water and sediment samples are to be collected at the same location, surface water samples will be collected first in accordance with Section 7 of the CSAP either by placing the sample bottle in the surface water or by using a Kemmerer sampling device (depending on the depth of the water).

Sediment samples will be collected from the upper 6 inches of the substrate in accordance with Section 7.2 of the CSAP. Surface water samples will be collected at the same depths outlined in Section 7.3 of the CSAP. Sediment and surface water sampling locations are shown in the Site 41 SAP.

5.2 Phase IIB — Diversity Studies and Toxicity Tests

Samples will be collected from the upper 6 inches of the sediment using either a stainless steel hand auger or a Petite Ponar Dredge in accordance with Section 7.2 of the CSAP. To the greatest extent possible, all samples will have a uniform and consistent amount of substrate sampled to achieve an accurate comparison. Diversity studies will not be performed on the organisms within the surface water because of the high degree of variability of these organisms based on factors such as precipitation, tides, and other non-site related factors. The results of the diversity studies may be statistically analyzed using ANOVA or other statistical comparisons

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to give a more accurate representation of the differences between the reference wetland and the wetland of concern. Some of the sandy sediments may have a naturally low diversity of organisms. In these cases, more emphasis may be placed on the toxicity tests described in the next paragraph.

Samples for diversity studies and toxicity testing, if analyzed, will be collected at the same sample locations analyzed for chemical parameters. Results from the wetland of concern will be compared with the reference wetland.

5.3 Phase III — Assessment of Bioaccumulation

The test organisms selected for Phase III Assessments may vary within the wetlands, depending on the types of higher trophic level organisms living in and around the particular area in question. Specific procedures for sampling and testing individual organisms vary and will be done in accordance with established EPA and ASTM guidelines. Appropriate organisms, sampling methods, and test organisms will be selected based on the results of the previous studies and consultations with the contracted laboratory.

The additional toxicity testing in Phase III can be used to determine acute endpoints such as LD_{50}. In selecting test organisms, emphasis will be placed on organisms that: (1) are lower in the food chain, (2) inhabit the suspected contaminated media of the particular area in question, and (3) are relatively immobile. The percent lipid content of these organisms must also be available to model contaminant uptake. Among the species to be considered are clams and oysters and other sessile filter feeders. Based on their relatively limited range, earthworms, various larval midges, fathead minnows, guppies, and other fish and terrestrial species might also be used.

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Laboratory-controlled, direct-exposure bioaccumulation studies on laboratory-cultured organisms and/or the in-situ sampling of various resident biota may be required to firmly assess the impact occurring in a wetland. Both methods may include analysis for confirmed contaminants. Results of the tissue analyses can determine if these contaminants are bioaccumulating in the test organisms and whether animals feeding on such organisms could be adversely affected. If both measures of bioaccumulation are implemented, the comparison of bioaccumulation in laboratory-cultured organisms to indigenous organisms could be used to estimate the influence that environmental conditions may have on the rate and degree of contaminant uptake.

5.4 Data Validation, Verification, and Evaluation

After each phase of data collection, the data will be validated. Data validation and verification will be done according to the procedures described in Section 14 of the CSAP. Once data is validated and verified, it will be classified according to the criteria in the CSAP. All data will then be fully evaluated, within the limits of its classification, for synthesis and inclusion in the RI report.

5.5 Remedial Investigation Report and Ecological and Human Health Risk Assessment

Following the conclusion of all fieldwork activities, an RI report will be prepared providing all of the investigative data, summarizing and integrating the results of the investigation. In addition, a human health and ecological risk assessment will be quantified and included in this report. The risk assessment will appraise the wetland's actual or potential threat to human health and ecological resources if no remedial action is taken and provide a basis for determining if remedial action is necessary. The risk assessment will be performed in accordance with the EPA's 1989 risk assessment framework document (EPA 1989).

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5.6 Feasibility Study (FS)

The FS will be submitted separately from the RI. As the FS proceeds and the wetlands are more fully characterized, the remedial action objectives and technologies will be evaluated for their applicability. Data documenting the physical, geological, and hydraulic constraints of the wetland, levels of contamination and proposed cleanup goals, and treatability of the affected environmental media will be used to make the initial evaluation. Where sufficient data are available to fully develop and evaluate alternatives, a treatability study is not planned. At this stage in the RI/FS process, it is difficult to state a conclusive need for treatability investigations. Treatability studies vary in scope from bench scale testing to pilot or field trials of treatment and containment technologies.

Once wetland characterization and initial risk assessment are complete, a report documenting the applicable technologies will be submitted to EPA and FDEP. The primary criteria in the evaluation of the technologies are (1) the short-term and long-term effectiveness, (2) practicality, (3) cost, (4) protectiveness, and (5) ARAR compliance. The report will document the initial evaluation of all applicable technologies according to these criteria and will provide an initial list of remedial alternatives. Once comment and approval of the initial list of remedial alternatives has been received, the development of a detailed analysis of alternatives can proceed. The selected remedial alternatives will be examined with respect to requirements stipulated in CERCLA as amended in OSWER (1986), and per guidance described in OSWER (1988). The detailed analysis will emphasize the following nine remedy selection criteria:

- short term effectiveness
- long-term effectiveness and permanence
- reduction of toxicity, mobility, or volume
- ability to implement
- cost

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- compliance with ARARs
- overall protection of human heath and the environment
- state acceptance
- community acceptance

Each technology will be evaluated according to these criteria. The results of this evaluation will be used to present the alternatives and compare the advantages and disadvantages of each.

The detailed analysis of alternatives consists of the analysis and presentation of the relevant information needed to select a site remedy. This approach to analyzing alternatives is designed to provide sufficient information to adequately compare the alternatives, select an appropriate remedy for a wetland, and demonstrate satisfaction of the CERCLA remedy selection requirements of the Record of Decision (ROD).

The feasibility study for the wetlands may be constrained because the wetlands may be a contaminant pathway, and not a source. Analysis of potential remediation activities may focus on transport mechanisms from the 20 IR sites and on existing contamination. Once these have been identified, the FS will focus on the role of the wetland as a source of contamination and potential remedial alternatives for the wetland itself.

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To ease readability this section has not been bolded.]**

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FLORIDA PROFESSIONAL GEOLOGIST SEAL

I have read and approve of this Final Work Plan for Site 41 and seal it in accordance with Chapter 492 of the Florida Statutes. In sealing this document, I certify the geological information contained in it is true to the best of my knowledge and the geological methods and procedures included herein are consistent with currently accepted geological practices.

Name:	Henry H. Beiro
License Number:	#1847
State:	Florida
Expiration Date:	July 31, 1996

Henry H. Beiro

Henry H. Beiro

20 Oct 1995

Date

Appendix A

NAS Pensacola Wetland Inventory

Table A-1 NAS Pensacola — Wetland Inventory								
Wetland Site	**Wetland Category**	**Vegetation Class**	**Dominant Floral Species**	**Wetland Indicator Status**	**Soil Color/ Type**	**Site Hydro-logy**	**Acre-age**	**Remarks**
1	Palustrine	Forested	*Pinus elliotti*	FACW	10YR 6/1	BLS	8.0	East of Sherman Field. A wooded area with a drainage ditch through it. Drains into wetland W2.
2	Palustrine	Emergent	*Panicum hemitomon* *Andropogon glomeratus*	OBL FACW	10YR 3/2	SW	1.6	Sanitary Landfill/Site 1 area. A forested zone with open areas.
3	Palustrine	Scrub Shrub/ Emergent	*Magnolia virginiana* *Typha latifolia*	FACW OBL	10YR 2/1	SW	5.5	Sanitary Landfill/Site 1 area. Old beaver pond.
4A	Palustrine	Forested	*Magnolia virginiana*	FACW	10YR 2/1	BLS	0.6	Golf course area.
4B	Palustrine	Emergent	*Sagittaria latifolia* *Polygonum hydropiper-oides*	OBL OBL	10YR 2/1	SW	3.5	Golf course area. Beaver pond, pine snags and some open water.
4C	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	0.7	Golf course area.
4D	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	1.4	Off Bayou Grande, north side of golf course.
5A	Palustrine	Forested	*Salix nigra* *Magnolia virginiana*	OBL	—	SW	0.5	Heavily forested swamp west side of Murray Rd., adjacent NADEP buildings 649/755.
5B	Palustrine	Emergent	*Typha latifolia* *Lilaeopsis carolinensis* *Hydrocotyle* sp. *Sagittaria* sp.	OBL OBL FACW OBL	—	SW	1.9	Stream that begins as wetland 5A, flows under Murray Road, and drains into wetland 6. Emergent with scrub shrub along shore. Contained rare Carolina Lily *(L. carolinensis)*.

Table A-1
NAS Pensacola — Wetland Inventory

Wetland Site	Wetland Category	Vegetation Class	Dominant Floral Species	Wetland Indicator Status	Soil Color/ Type	Site Hydro-logy	Acre-age	Remarks
6	Palustrine	Emergent	*Sagittaria* sp. *Hydrocotyle* sp.	OBL	—	SW	1.2	0.75 mile long drainage ditch-drains western parts of Chevalier Field, as well as wetlands 5A/5B.
7	Palustrine	Emergent	*Typha latifolia*	OBL	—	SW	1.0	Brackish zone at extreme upper end of yacht basin. Receives inflow from wetland 6.
8	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	6.5	Estuarine emergent zone along littoral area of yacht basin.
9	Palustrine	Emergent	*Typha latifolia*	OBL	—	SW	10	3 man-made treatment ponds at IWTP. SW pond has palustrine emergent vegetation.
10A	Palustrine	Emergent	*Hydrocotyle* sp.	FACW	—	SW	1.2	South of IWTP bilge water storage facility. Drainage ditch with standing water.
10B	Estuarine	Emergent	*Spartina patens*	OBL	—	—	0.4	Remnant wetland at western end of wetland 10A/B.
11	Palustrine	Emergent	*Typha latifolia* *Asclepias* sp.	OBL	—	—	0.2	A remnant wetland north of wetland 10A/B.
12	Palustrine	Forested/ Scrub shrub	*Salix nigra* *Sabal palmetto*	OBL FACW	—	SW	0.5	A small wetland north of wetland 10A/B.
13	Palustrine	Forested/ Emergent	*Salix nigra* *Polygonum* sp.	OBL OBL	—	SAT	0.7	A small wetland directly east of the IWTP bilge water storage facility.

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Wetland Site	**Wetland Category**	**Vegetation Class**	**Dominant Floral Species**	**Wetland Indicator Status**	**Soil Color/ Type**	**Site Hydro-logy**	**Acre-age**	**Remarks**
14	—	—	—	—	—	—	—	Parsons and Pruitt (1991) refer to this as a non-wetland sand pit (resides within Sanitary Landfill/Site 1 area).
15	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	1.2	A small estuarine wetland off Bayou Grande, NE of the Sanitary Landfill/Site 1.
16	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	0.8	A small estuarine wetland off Bayou Grande, west of the Sanitary landfill/Site 1.
17	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	0.7	A small estuarine wetland off Bayou Grande, west of Sanitary Landfill/Site 1.
18A	Palustrine	Emergent	*Cladium jamaicense*	OBL	Muck	—	1.3	Off Bayou Grande, west of Sanitary Landfill/Site 1. A small brackish wetland inland from wetland 18B.
18B	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	0.6	Off Bayou Grande, west of Sanitary Landfill/Site 1. A small wetland seaward of wetland 18A.
19A	Palustrine	Emergent	*Typha latifolia*	OBL	—	—	2.2	A drainage ditch on NE side of Sherman Field. Drains wetland 20, flowing into 19B.
19B	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	1.0	Off Bayou Grande, NE of Sherman Field, seaward of wetland 19B.
20	Palustrine	Emergent	*Panicum hemitomon*	OBL	10YR 2/1	—	6.7	A drainage ditch NE of Sherman Field (parallels runway 07L). Continues as wetland 19A.

Table A-1
NAS Pensacola — Wetland Inventory

Wetland Site	Wetland Category	Vegetation Class	Dominant Floral Species	Wetland Indicator Status	Soil Color/ Type	Site Hydro-logy	Acre-age	Remarks
21	Palustrine	Forested/ Emergent	*Pinus elliotii* *Lachnanthes caroliniana*	FACW OBL	10YR 2/1	BLS	35.0	A pine woodland NE of runway 01 at Sherman Field.
22A	Palustrine	Forested/ Scrub shrub	*Magnolia virginiana* *Cliftonia monophylla*	FACW+ OBL	10YR 2/1	SW	2.1	Off Bayou Grande, NE of Sherman Field. A linear wetland inland from wetland 22B.
22B	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	1.2	Off Bayou Grande, NE of Sherman Field. A linear wetland seaward of wetland 22A.
23	Palustrine	Forested/ Emergent	*Pinus elliotii* *Eleocharis* sp.	FACW OBL	—	SW	0.8	A small elongate drainage ditch NE of Sherman Field.
24A	Palustrine	Forested/ Scrub shrub	*Magnolia virginiana* *Cliftonia monophylla*	FACW+ OBL	10YR 4/1	—	1.0	Off Bayou Grande, NE of Sherman Field. A small wetland inland from wetland 24B.
24B	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	1.8	Off Bayou Grande, NE of Sherman Field. A small wetland seaward of wetland 24A.
25A	Palustrine	Forested/ Scrub shrub	*Magnolia virginiana* *Cliftonia monophylla*	FACW+ OBL	10YR 2/1	—	6.5	Off Bayou Grande, NE of Sherman Field. A moderately-sized wetland inland of wetland 25B.
25B	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	1.8	Off Bayou Grande, NE of Sherman Field. A small wetland seaward of wetland 25A.
26	Palustrine	Forested/ Scrub shrub	*Pinus elliotii* *Ilex myrtifolia*	FACW OBL	10YR 3/2	BLS	6.3	A forested area NE of Sherman Field. Most of understory recently cleared by fire.

Table A-1
NAS Pensacola — Wetland Inventory

Wetland Site	Wetland Category	Vegetation Class	Dominant Floral Species	Wetland Indicator Status	Soil Color/ Type	Site Hydro-logy	Acre-age	Remarks
27A	Palustrine	Forested/ Scrub shrub	*Magnolia virginiana* *Cliftonia monophylla*	FACW+ OBL	10YR 2/1	—	2.5	Off Bayou Grande, north of Sherman Field. A small wetland inland of wetland 27B.
27B	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	0.5	Off Bayou Grande, north of Sherman Field. A small wetland seaward of wetland 27A.
28A	Palustrine	Forested/ Scrub shrub	*Magnolia virginiana* *Cliftonia monophylla*	FACW+ OBL	10YR 2/1	BLS	1.8	Off Bayou Grande, north of Sherman Field. A small wetland inland of wetland 28B.
28B	Estuarine	emergent	*Juncus roemerianus*	OBL	Muck	TDL	1.0	Off Bayou Grande, north of Sherman Field. A small wetland seaward of wetland 28A.
29	Palustrine	Forested/ Scrub shrub	*Magnolia virginiana* *Cliftonia monophylla* *Pinus* sp. *Quercus* sp. *Juncus roemerianus*	FACW+ OBL FACW FACW OBL	10YR 6/1	BS/SAT	15.8	Densely overgrown area. Near SW shore on Intercoastal Waterway; SW of Blue Angel parkway.
30	Palustrine	Forested	*Pinus elliotii* *Cliftonia monophylla*	FACW OBL	10YR 2/1	SW	0.9	Small wetland west of wetland 53, north of wetland 31.
31	Palustrine	Forested/ Scrub shrub	*Pinus elliotii* *Cliftonia monophylla*	FACW OBL	10YR 6/1	BLS	56.2	A large forested area west of wetland 29.
32	Palustrine	Emergent	*Lachnanthes caroliniana*	OBL	—	SW/SAT	2.3	A small brackish wetland inland of wetland 33.
33	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	10.2	A large estuarine wetland off of SW shore on Intercoastal Waterway; SW of Blue Angel Parkway.

Table A-1 NAS Pensacola — Wetland Inventory								
Wetland Site	Wetland Category	Vegetation Class	Dominant Floral Species	Wetland Indicator Status	Soil Color/ Type	Site Hydro-logy	Acre-age	Remarks
34	Estuarine	Aquatic bed	*Thallasia testudinum* *Halodule wrightii* *Syringodium filiforme*	OBL	—	TDL	27.2	SW shore of Intercoastal Waterway, west of Sherman's Cove. Intermittent bands of vegetation appear about 30 feet offshore.
35	Palustrine	Forested/ Emergent	*Pinus* sp. *Ilex vomitoria* *Juncus roemerianus*	FACW OBL OBL	—	SW in depress-ions	0.3	Isolated depression approximately 50 yards inland from shore of Intercoastal Waterway. Vicinity of wetlands 29/33.
36	Palustrine	Forested/ Emergent	*Pinus elliotii* *Cliftonia monophylla*	FACW OBL	10YR 6/1	BLS	13.7	A densely forested low lying zone off of Lillian Hwy.
37	Palustrine	Forested/ Emergent	*Magnolia virginiana* *Osmunda cinnamomea*	FACW+ FACW+	10YR 2/1	SAT	0.9	Remnant wetland off of Duncan Rd., near NAS Pensacola child care center.
38	Palustrine	Forested/ Emergent	*Taxodium distichum* *Hydrocotyle* sp.	OBL FACW	10YR 3/2	SAT	1.2	Remnant wetland downstream (across road) from wetland 37.
39A	Palustrine	Forested/ Scrub shrub	*Pinus elliotii* *Cliftonia monophylla*	FACW OBL	10YR 2/1	SAT	7.2	North of Sherman Field. Surrounds a tidal creek draining wetland 72; drains into wetland 39B.
39B	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	3.5	North of Sherman Field, off Bayou Grande. Receives inflow from wetland 39A.
40	Palustrine	Forested/ Emergent	*Pinus elliotii* *Lachnanthes caroliniana* *Sarracenia leucophylla*	FACW OBL OBL	10YR 3/1	BLS	9.5	Forested zone NW of Sherman Field. Contained sizeable rare white-top pitcher plant *(S. leucophylla)* population.

Table A-1 NAS Pensacola — Wetland Inventory								
Wetland Site	Wetland Category	Vegetation Class	Dominant Floral Species	Wetland Indicator Status	Soil Color/ Type	Site Hydro-logy	Acre-age	Remarks
41A	Palustrine	Forested/ Emergent	*Pinus elliotii* *Woodwardia* sp.	FACW FACW	10YR 2/1	SAT	18.1	Forested zone NW of Sherman Field, adjoining wetland 41B. Small drainage ditch runs its length.
41B	Palustrine	Forested/ Scrub shrub	*Pinus elliotii* *Ilex glabra*	FACW FACW	—	BLS	12.1	Forested area directly east of wetland 41A. Small drainage ditch runs its length.
42	Palustrine	Forested	*Magnolia virginiana*	FACW+	10YR 2/1	BLS	1.7	A small forested area NW of Sherman Field.
43	Palustrine	Forested/ Emergent	*Pinus elliotii* *Magnolia virginiana* *Lachnanthes caroliniana*	FACW FACW+ OBL	—	SW/SAT	47.2	Western fringe of NAS Pensacola, along Lillian Hwy. A low lying wooded area with standing water.
44	Palustrine	Scrub shrub/ Emergent	*Pinus* sp. *Salix nigra* *Drosera* sp. *Ilex* sp. *Lacnanthes caroliniana*	FACW OBL OBL FACW OBL	10YR 2/1	SAT	39.5	Approach path to Sherman Field's runway 07. Large flat open area with some standing water. Contained sizeable rare sundew (*Drosera* sp.) population.
45	Palustrine	Forested/ Emergent	*Taxodium ascendens* *Lachnanthes caroliniana* *Drosera* sp. Mosses	OBL OBL OBL OBL	10YR 2/1	SW	0.9	A drainage ditch between wetlands 44 and 47. Banks lined with rare sundew (*Drosera* sp.).
46	Palustrine	Emergent	*Lachnanthes caroliniana*	OBL	10YR 2/1	BLS	4.6	A flat grassy area NW of Sherman Field's runway 07.
47	Palustrine	Scrub shrub/ Emergent	*Ilex glabra* *Clethra alnifolia*	FACW FACW	—	BLS	53.5	A forested woodland NW of Sherman field.
48	Palustrine	Forested	*Pinus* sp. *Nyssa sylvatica*	FACW FACW+	—	BLS	36.5	A forested woodland SW of Sherman Field.

Table A-1 NAS Pensacola — Wetland Inventory								
Wetland Site	Wetland Category	Vegetation Class	Dominant Floral Species	Wetland Indicator Status	Soil Color/ Type	Site Hydro-logy	Acre-age	Remarks
49	Palustrine	Forested	*Nyssa sylvatica* *Pinus elliotti* *Taxodium ascendens*	FACW+ FACW OBL	10YR 2/1	BLS	55.2	A forested woodland SW of Sherman Field.
50	Palustrine	Forested/ Emergent	*Magnolia virginiana* *Cliftonia monophylla*	FACW+ OBL	10YR 2/1	SW	4.6	A largely cleared area SW of Sherman Field.
51	Palustrine	Forested/ Scrub shrub	*Pinus* sp. *Quercus* sp. *Magnolia virginiana*	FACW FACW FACW+	10YR 3/1	BLS	3.7	A small forested zone west of Sherman Field.
52A	Palustrine	Forested/ Scrub shrub	*Magnolia virginiana* *Cliftonia monophylla* *Pinus* sp. *Quercus* sp. *Serenoa repens*	FACW+ OBL FACW FACW FAC	10YR 2/1	BLS	27.9	A heavily forested zone SW of Sherman field's runway 01.
52B	Palustrine	Forested/ Emergent	*Pinus* sp. *Magnolia virginiana* *Cliftonia monophylla* *Cladium jamaicense* *Juncus roemerianus*	FACW FACW+ OBL OBL OBL	10YR 2/1	SW/SAT	38.9	Heavily forested zone SW of Sherman Field's runway 01. Portion along Blue Angel Parkway has standing water.
52C	Palustrine	Scrub shrub/ Emergent	*Cliftonia monophylla* *Sagittaria lancifolia*	OBL OBL	—	SW	1.1	Small wetland within wetland 52B.
52D	Palustrine	Emergent	*Pinus* sp. *Typha latifolia* *Lachnanthes caroliniana* *Saururus cernus* *Hydrocotyle* sp.	FACW OBL OBL OBL FACW	—	SAT	9.1	Located on east and west sides of approach path to Sherman Field's runway 01.
52E	Palustrine	Forested/ Scrub shrub	*Pinus elliotti* *Cyrilla racemiflora*	FACW FACW	—	SW/SAT	27.6	Low lying forested area draining SE portion of Sherman Field. Has areas of standing water.

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Wetland Site	Wetland Category	Vegetation Class	Dominant Floral Species	Wetland Indicator Status	Soil Color/ Type	Site Hydro-logy	Acre-age	Remarks
53	Palustrine	Forested/ Emergent	*Pinus* sp. *Magnolia virginiana* *Cladium jamaicense* *Typha latifolia* *Juncus roemerianus* Lilies	FACW FACW+ OBL OBL OBL OBL	—	SW	4.0	Swamp with emergent and floating leaf plants
54	Estuarine	Emergent	*Thallasia testudinum* *Halodule wrightii* *Syringodium filiforme*	OBL OBL OBL	—	TDL	26.0	Sherman's Cove and small area on shoreline west of cove's inlet.
55	Palustrine	Emergent	*Cladium jamaicense* *Typha latifolia*	OBL OBL	Muck	SW/TDL	0.4	South of Sherman Field. A series of drainage ditches draining SE portion of Sherman field. Connects with Sherman's Inlet.
56A	Palustrine	Emergent	*Cladium jamaicense* *Typha latifolia*	OBL OBL	—	SW	1.8	A palustrine emergent wetland in the back end of Sherman's Inlet.
56B	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	5.4	Tidal marsh along littoral areas of Sherman's Inlet.
57	Palustrine	Forested/ Emergent	*Pinus elliotti* *Magnolia virginiana*	FACW FACW+	10YR 2/1	SAT	1.8	South of Blue Angel Parkway, in the vicinity of Fort Barrancas.
58	Palustrine	Scrub shrub	*Cyrilla racemiflora* *Clethra occidentalis*	FACW OBL	—	—	4.2	South of Blue Angel Parkway, in the vicinity of Fort Barrancas.
59	—	—	—	—	—	—	—	Parsons and Pruitt (1991) refer to this as an area converted to ball fields.
60	Palustrine	Forested/ Scrub shrub	*Pinus elliotti* *Cyrilla racemiflora*	FACW FACW	10YR 5/1	BLS	1.3	South of Blue Angel Parkway, west of ball fields.

Table A-1
NAS Pensacola — Wetland Inventory

Wetland Site	Wetland Category	Vegetation Class	Dominant Floral Species	Wetland Indicator Status	Soil Color/ Type	Site Hydro-logy	Acre-age	Remarks
61	Palustrine	Forested	*Pinus elliotti*	FACW	10YR 5/1	—	1.6	South of Blue Angel Parkway, west of ball fields.
62	Palustrine	Emergent	*Cladium jamaicense*	OBL	—	SAT	0.9	Small wetland NE of Sherman's Cove.
63A	Estuarine	Emergent	*Pinus* sp. *Phragmites australis*	FACW FACW	—	SW/SAT	4.0	East of Chevalier Field, north of dredge disposal area.
63B	Estuarine	Emergent	*Phragmites australis* *Cladium jamaicense*	FACW OBL	—	SW/SAT	4.3	East of Chevalier Field, south of dredge disposal area.
64	Palustrine	Scrub shrub	*Typha latifolia*	OBL	—	SW	0.9	Narrow band adjacent SW littoral area of yacht basin.
65	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	2.4	Off Bayou Grande, northern portion of the NAS Pensacola golf course.
66	Estuarine	Emergent	*Cladium jamaicense* *Juncus roemerianus*	OBL OBL	Muck	TDL	0.6	NE of Sherman Field. A small wetland off Bayou Grande.
67	Estuarine	Emergent	*Cladium jamaicense* *Juncus roemerianus*	OBL OBL	Muck	TDL	0.5	NE of Sherman Field. A small wetland off Bayou Grande.
68	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	0.6	NE of Sherman Field. A small wetland off Bayou Grande. Sits between wetlands 22B and 24B.
69	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	0.9	NW of Sherman Field. Two small wetlands off Bayou Grande
70A	Palustrine	Forested/ Scrub shrub	*Magnolia virginiana* *Cliftonia monophylla*	FACW+ OBL	—	—	0.9	NW of Sherman Field, off Bayou Grande. Inland of wetland 70A.

Table A-1
NAS Pensacola — Wetland Inventory

Wetland Site	Wetland Category	Vegetation Class	Dominant Floral Species	Wetland Indicator Status	Soil Color/ Type	Site Hydro-logy	Acre-age	Remarks
70B	Estuarine	Emergent	*Juncus roemerianus*	OBL	Muck	TDL	0.8	NW of Sherman Field, off Bayou Grande. Seaward of wetland 70B.
71	Palustrine	Scrub shrub	*Cephalanthus occiden-talis*	OBL	—	BLS	1.2	Small wetland NW of Sherman Field.
72	Palustrine	Forested	*Pinus* sp. *Quercus* sp. *Cliftonia monophylla*	FACW FACW OBL	—	SW	3.2	NW of Sherman Field. A channelized stream that drains into wetlands 39A/39B.
73A	Palustrine	Forested	*Pinus elliotti*	FACW	—	BLS	7.3	A small forested woodland NW of Sherman Field.
73B	Palustrine	Emergent	*Panicum hemitomon*	OBL	—	BLS	2.6	An open grassy area, west side of approach end of Sherman Field's runway 19.
74	Palustrine	Emergent	*Pinus* sp. *Typha latifolia* *Sagittaria lancifolia* Lilies	FACW OBL OBL OBL	—	SW	0.5	Small wetland located within western portion of wetland 52D. Permanently flooded with emergent and scrub shrub vegetation.
75	Palustrine	Emergent	*Typha latifolia* *Saururus cernus* Ferns	OBL OBL OBL	—	SAT	0.7	North side of Blue Angel Parkway, near western NAS Pensacola gate. Adjacent to SW corner of wetland 48.
76	Palustrine	Forested/ Scrub shrub	*Magnolia virginiana* *Nyssa Aquatica*	FACW+ OBL	—	BLS	0.8	North side of Blue Angel Parkway, near western NAS Pensacola gate. West of wetland 75.
77	Palustrine	Forested/ Emergent	*Pinus elliottii* *Aristide* sp.	FACW	—	—	6.0	Off Blue Angel Parkway, adjacent to SW NAS Pensacola boundary fence.

Table A-1
NAS Pensacola — Wetland Inventory

Wetland Site	Wetland Category	Vegetation Class	Dominant Floral Species	Wetland Indicator Status	Soil Color/ Type	Site Hydro-logy	Acre-age	Remarks
78	Palustrine	Forested/ Emergent	*Pinus elliottii* *Aristide* sp.	FACW	—	—	20.0	At western NAS Pensacola boundary, near junction of Blue Angel Parkway and Lillian Highway.
79	—	—	—	—	—	—	10.4	Disturbed area at old landfill site adjacent to Sherman Field. Spotted with weeds and a few isolated trees.
W1	Palustrine	Emergent	*Salix nigra* *Hydrocotyle* sp. *Drosera* sp.	OBL FACW OBL	—	SAT	2.2	SW side of Sherman Field. Elongated drainage area that parallels the SW side of runway 01, south of runway 07.
W2	Palustrine	Emergent	*Magnolia virginiana* *Sagittaria* sp. Grasses	FACW+ OBL	—	SW	2.2	NE side of Sherman Field. A wet drainage ditch that drains east side of Sherman Field. Drains into Bayou Grande.

Derived from: Parsons and Pruitt (1991), E & E (1992a)
Wetland Indicator Status: (1) FACW(+) = Facultative wetland plant, (2) OBL = Obligate wetland plant.
Soil Type[1]: Munsell Soil Color Charts.
Site Hydrology[1]: (1) BLS = Below Land Surface, (2) SAT = Saturated, (3) SW = Standing water, (4) TDL = Tidal.
Note: — indicates insufficient or unreliable data available.

Table A-2
Distribution of Designated Wetlands/Wetland Fractions at NAS Pensacola

Palustrine Forested	Palustrine Forested/ Emergent	Palustrine Forested/ Scrub Shrub	Palustrine Scrub Shrub	Palustrine Scrub Shrub/ Emergent	Palustrine Emergent	Estuarine Emergent	Estuarine Aquatic Bed
1	13	12	58	3	2	4C	34
4A	21	22A	64	47	4B	4D	54
5A	23	24A	71	52C	5B	8	
30	37	26		52D	6	10B	
42	38	27A			7	15	
48	40	28A			9	16	
49	41A	29			10A	17	
51	43	31			11	18B	
52B	45	36			18A	19B	
61	50	39A			19A	22B	
72	53	41B			20	24B	
73A	57	52A			32	25B	
	77	52E			35	27B	
	78	60			44	28B	
		70A			46	33	
		76			55	39B	
		25A			56A	56B	
					62	63A	
					73B	63B	
					74	65	
					75	66	
					79	67	
					W1	68	
					W2	69	
						70B	

Sources: Parsons and Pruitt (1991), E & E (1992a)

Appendix B

Soil Series Types

Table B-1
Soil Series Types at NAS Pensacola

Series Name	Depth (inches)	USDA Texture	USCS Classification
Foxworth	0-10 0-52 2-80	S, FS S, FS S, FS	SP-SM SP-SM SP, SP-SM
Resota	0-80	S, FS	SP, SM, SP-SM
Urban Land	0-6	VAR.	—
Arents	0-10 0-10 10-32 32-60	S, FS, CS-S LS, SL S, FS S, FS	SP, SP-SM SM, SP-SM SP, SP-SM SP, SP-SM
Kureb	0-80	S, COS, FS	SP, SP-SM
Pits	0-60	VAR.	—
Lakeland	0-43 43-80	S, FS S, FS	SP-SM SP, SP-SM
Croatan	0-28 28-38 38-60 60-80	MUCK SL, FSL, MK-SL L, CL, SCL VAR.	PT SM, SC, SM-SC CL, SM, ML, SC
Pickney	0-34 0-34 38-40	LFS, LS S, FS LFS, LS, FS, S, CS	SM, SP-SM SM, SP-SM SP, SP-SM, SM
Duckston	0-8 8-80	S, FS S, FS	SP-SM, SP SP-SM, SP
Dirego	0-28 28-80	MUCK, SP FS, LFS, FSL	PT SM, SP-SM
Corolla	0-72	S, FS	SW, SP-SM, SP
Newman	0-64	FS, S	SP, SP-SM

Table B-1 Soil Series Types at NAS Pensacola			
Series Name	**Depth (inches)**	**USDA Texture**	**USCS Classification**
Leon	0-3 3-15 15-30 30-80	S, FS S, FS S, FS, LS S, FS	SP, SP-SM SP, SP-SM SM, SP-SM, SP SP, SP-SM
Beaches	0-6 6-60	COS, S, FS COS, S, FS	SP SP
Hurricane	0-6 6-51 51-55 55-80	S, FS S, FS S, FS, LS S, FS	SP, SP-SM SP, SP-SM SP-SM, SM SP, SP-SM, SM

Key:

C — Clay
CL — Clay loam
COS — Coarse sand
CS — Coarse sand
FS — Fine sand
FSL — Fine sandy loam
L — Loam
LS — Loamy sand (medium)
LFS — Loamy fine sand
MK — Muck
S — Sand
SL — Sandy loam (medium)
SCL — Sandy clay loam

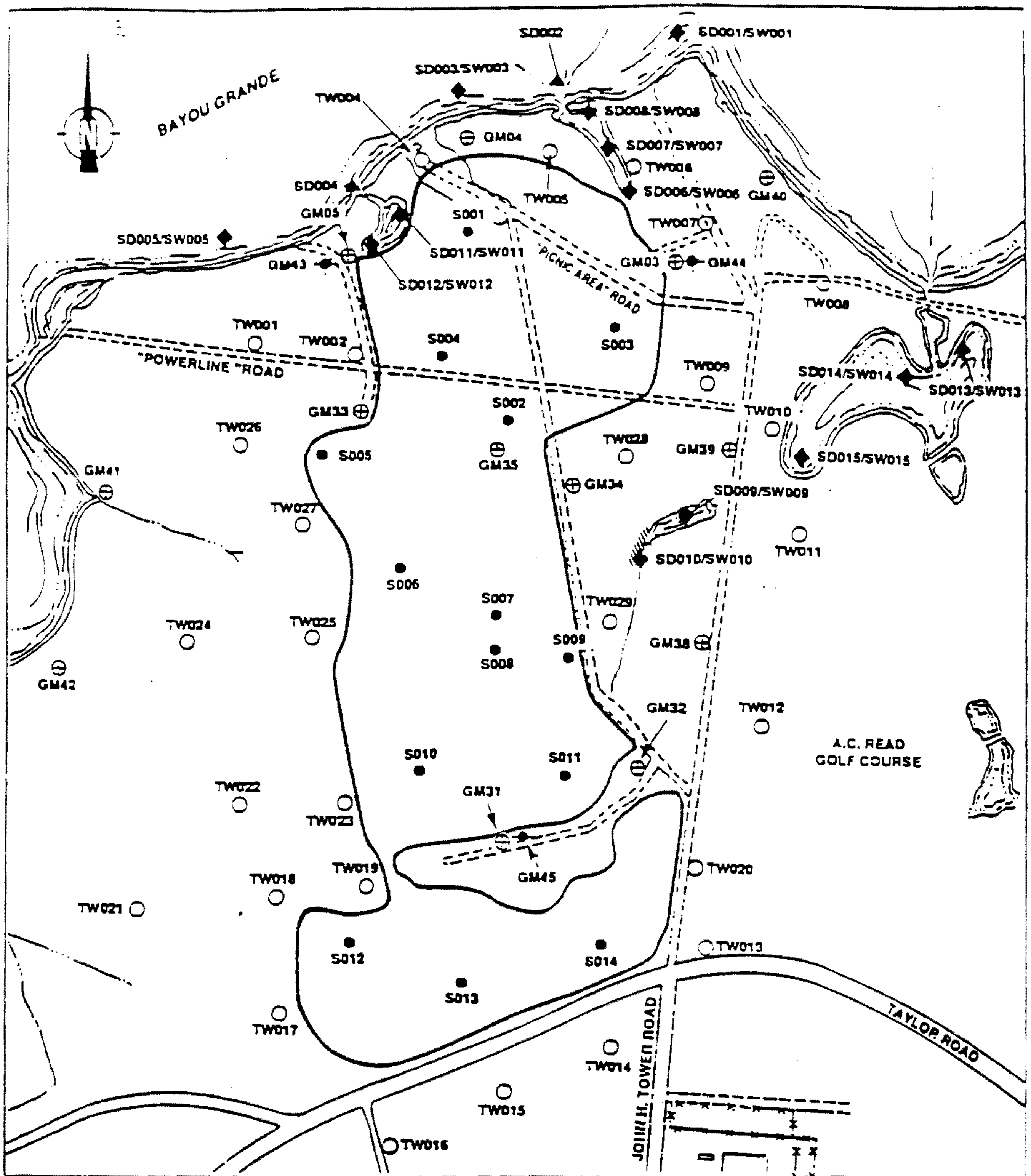
VAR — Variable
SP — Poorly-graded sands, gravelly sands, little or no fines.
SM — Silty-sands, sand-silt mixtures.
SW — Well-graded sands, gravelly sands, little or no fines.
PT — Peat, humus, swamp soils with high organic contents.
CL — Inorganic clays of low to medium plasticity, gravelly, sandy, silty or lean clays.
ML — Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity.

Reference: USDA Soil Conservation Service, 1/92

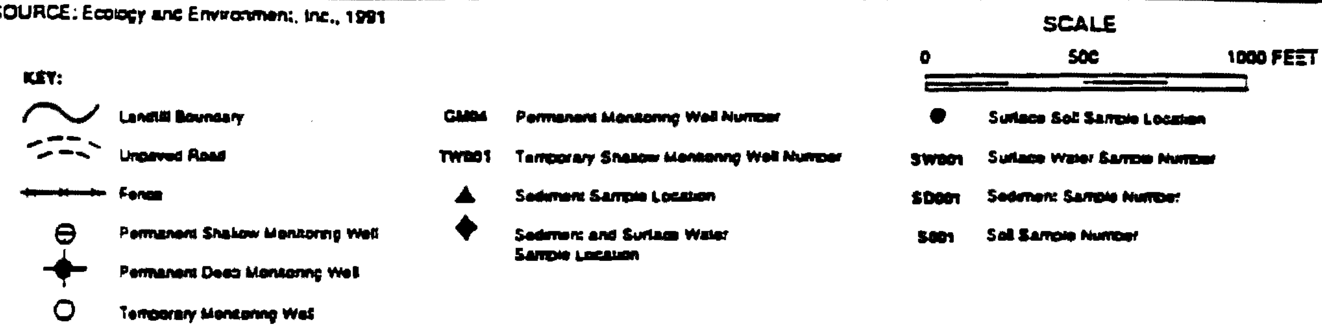
Appendix C

Previous Analytical Results

Results of E&E's Phase I Investigation of Eight Wetlands
Naval Air Station Pensacola (NASP), Pensacola, Florida



SOURCE: Ecology and Environment, Inc., 1991



TEMPORARY MONITORING WELL LOCATIONS AND SURFACE WATER, SEDIMENT, AND SURFACE SOIL SAMPLING LOCATIONS — NAS PENSACOLA SITE 1

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SUMMARY ANALYTICAL SCREENING RESULTS FOR SURFACE WATER SAMPLES
NAS PENSACOLA SITE 1
(All results in µg/L)

Parameter	[Detection Limit	P01SW001 (SW001)	P01SW003 (SW003)	P01SW005 (SW005)	P01SW006 (SW006)	P01SW007 (SW007)	P01SW008 (SW008)	P01SW009 (SW009)	[FSWS
		Sample Number (Location)							
Chromium	10	--	--	--	13	34	--	18	50
Zinc	20	20	--	--	100	34	38	43	30]
Chlorobenzene	5]	--	--	--	--	--	--	--	

Key at end of table.

(Cont.)

Parameter	[Detection Limit	Sample Number (Location) P01SW010 (SW010)	P01SW011 (SW011)	P01SW012 (SW012)	P01SW012D[a] (SW012)	P01SW013 (SW013)	P01SW014 (SW014)	P01SW015 (SW015)	[FSWS
Chromium	10	23	--	--	21	--	--	--	50
Zinc	20	35	48	21	21	22	--	--	30]
Chlorobenzene	5]	--	14	26	22	--	--	--	

Key:

[a]Duplicate of sample P01SW012.

[FSWS = Florida Class III Fresh Surface Water Standard.]

Dash (—) indicates compound not detected.

Source: Ecology and Environment, Inc., 1991.

SUMMARY ANALYTICAL SCREENING RESULTS FOR SEDIMENT SAMPLES
NAS PENSACOLA SITE 1
(All results in mg/kg, unless noted)

Parameter	Detection Limit	Sample Number (Location)							
		P01SD001 (SD001)	P01SD002 (SD002)	P01SD003 (SD003)	P01SD004 (SD004)	P01SD005 (SD005)	P01SD006 (SD006)	P01SD007 (SD007)	P01SD008 (SD008)
Chromium	1	1.9	1.1	--	1.2	1.7	7.9	3.4	6.2
Zinc	2	3.0	3.0	2.5	2.3	--	34	26	8.9
Lead	4	5.1	10	--	--	--	92	35	--
Cadmium	0.5	--	--	--	--	--	7.5	11	--
Copper	2.5	--	--	--	--	--	6.2	2.7	--
TRPHs	5	230	--	6.7	--	--	5.2	--	14
Methylene Chloride (µg/kg)	1,000	--	--	--	--	--	4,000(B)	4,400(B)	3,700(B)
Total PAHs as Benzo-a-pyrene (µg/kg)	1,000	1,400	1,600	1,200	(L)	1,200	6,100	1,600	--
Phenols as Trichlorophenol (µg/kg)	2,000	--	--	--	--	--	5,800	5,100	--

Key at end of table.

(Cont.)

Parameter	[Detection Limit	Sample Number (Location)							
		P01SD009 (SD009)	P01SD010 (SD010)	P01SD011 (SD011)	P01SD012 (SD012)	P01SD012D[a] (SD012)	P01SD013 (SD013)	P01SD014 (SD014)	P01SD015 (SD015)
Chromium	1	6.7	4.9	6.1	19	21	2.7	2.0	18
Zinc	2	7.0	6.0	140	37	41	3.7	3.2	26
Lead	4	--	--	64	--	--	--	--	28
Cadmium	0.5	--	--	0.63	--	--	--	--	--
Copper	2.5	--	--	4.8	4.6	4.8	--	--	6.4
TRPHs	5	--	22	33	28	22	21	19	27
Methylene Chloride (µg/kg)	1,000	3,700(B)	3,600(B)	3,900(B)	4,200(B)	4,300(B)	3,400(B)	4,200(B)	3,800(B)
Total PAHs as Benzo-a-pyrene (µg/kg)	1,000	(L)	(L)	(L)	--	(L)	(L)	(L)	(L)
Phenols as Trichloro-phenol (µg/kg)	2,000]	5,900	--	--	--	--	--	(L)	9,600

Note: These results were reported on a wet-weight basis.

Key:

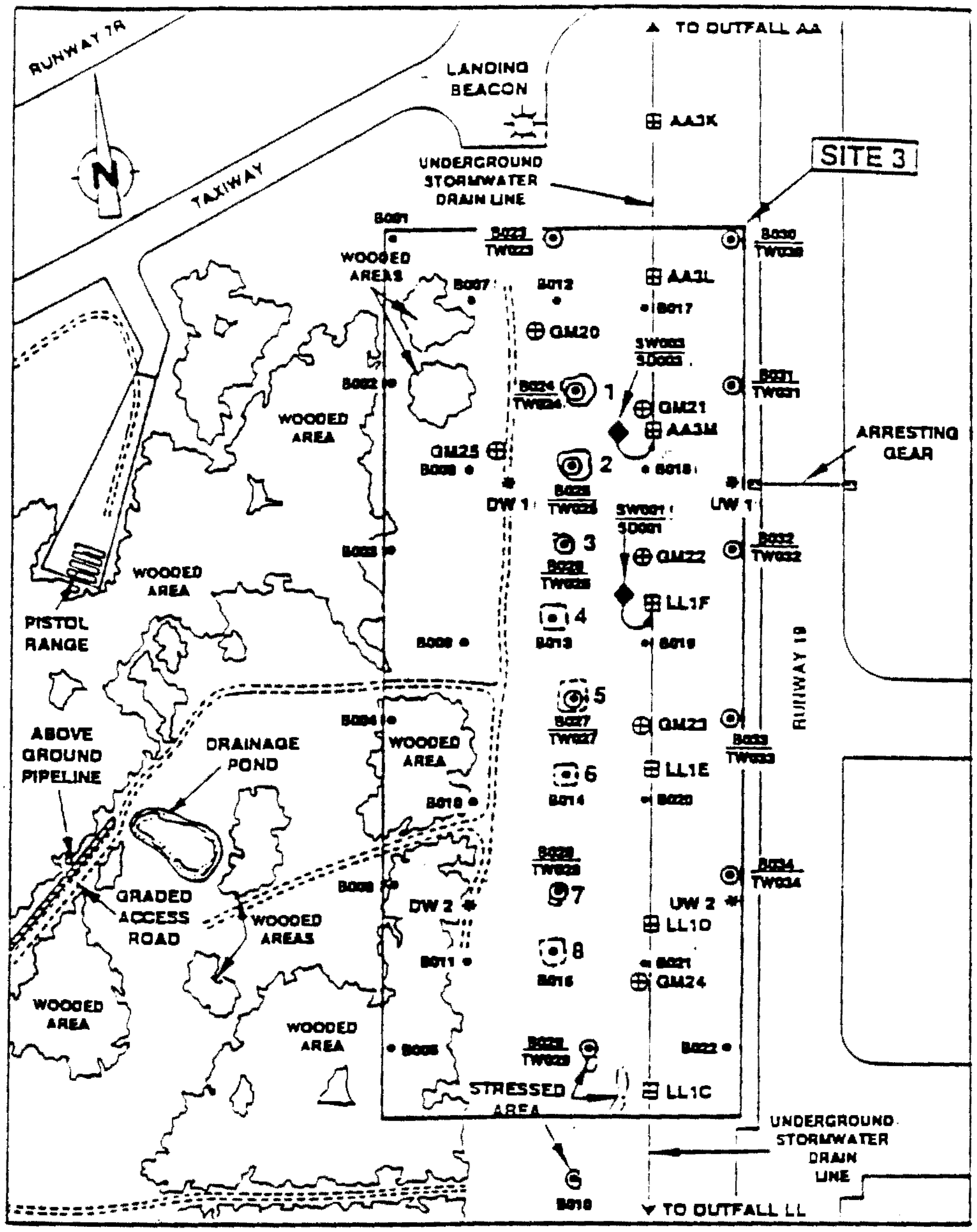
[a]Duplicate of sample P01SD012.

Dash (--) indicates compound not detected.

Qualifiers:

(B) = Compound also present in method blank.
(L) = Present below stated detection limit.

Source: Ecology and Environment, Inc., 1991.



SOURCE. U.S. Naval Air Station, Pensacola, Florida 1991; Ecology and Environment, Inc. 1991

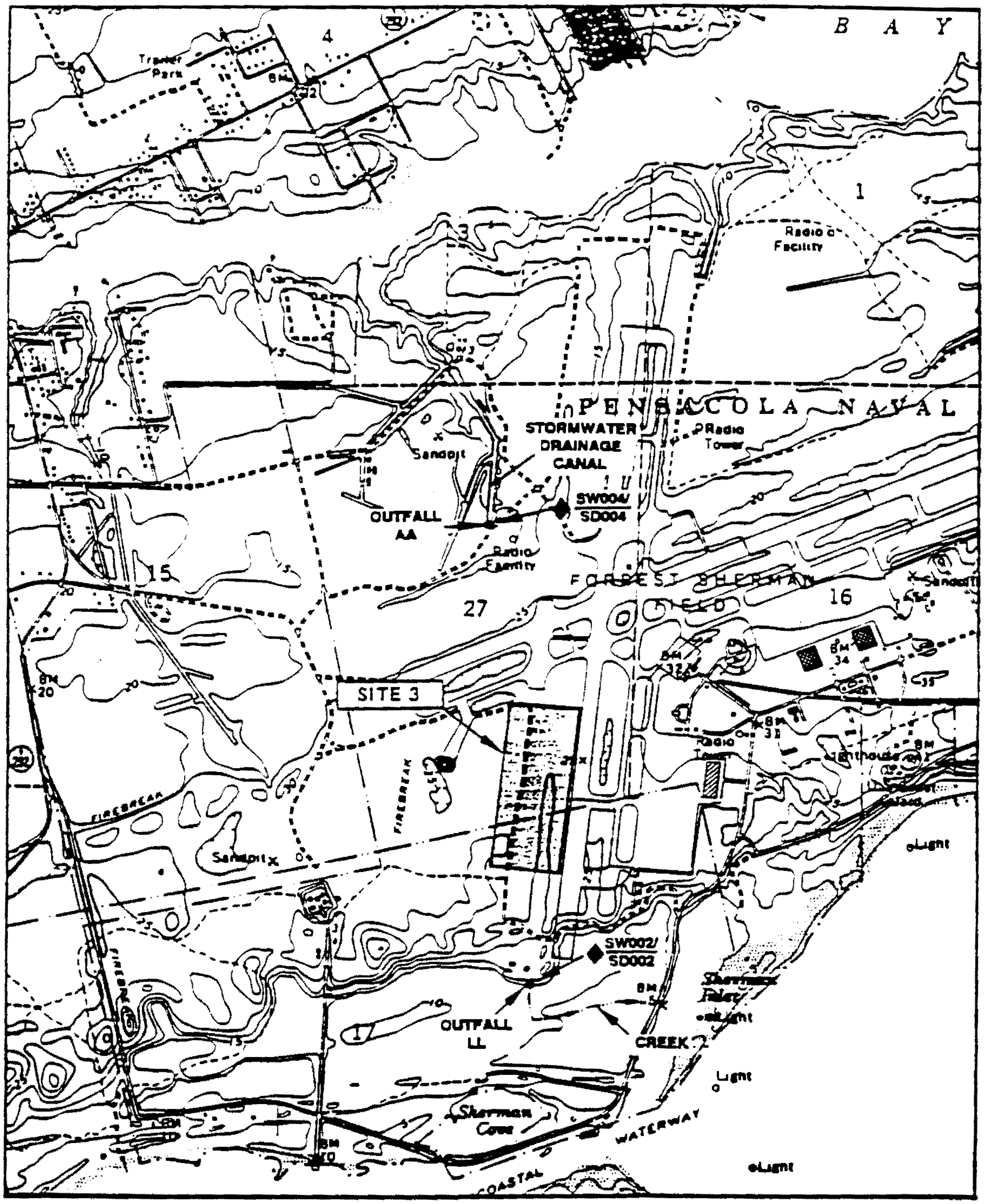
SCALE

0 100 200 400 600 800 FEET

KEY:

- Jeep Trail
- Stormwater Catch Basin with Grate
- AA3K/LL1C Stormwater Catch Basin Designation
- Active Burn Area
- Former Burn Area
- 1 Burn Area Number
- Existing Permanent Shallow Monitoring Well
- GM21 Permanent Monitoring Well Number
- Particulate Air Screening Location
- DW 1/UW 1 Particulate Air Screening Location Number (downwind/upwind)
- Surface Water and Sediment Sample Location
- SW001 Surface Water Sample Number
- SD001 Sediment Sample Number
- Soil Boring
- Temporary Monitoring Wel
- B023 Soil Boring Number
- TW023 Temporary Monitoring Well Number

PARTICULATE AIR SCREENING, ON-SITE SURFACE WATER AN SEDIMENT SAMPLING, SOIL BORING, AND TEMPORARY MONITORING WELL LOCATIONS NAS PENSACOLA SITE 3 — PHASE I



SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangles: Fort Barrancas, Fla. 1970 and West Pensacola, Fla. 1970, Photorevised 1987; Ecology and Environment, Inc., 1991

KEY:

◆ Surface Water and Sediment Sample Location

SW001 Surface Water Sample Number

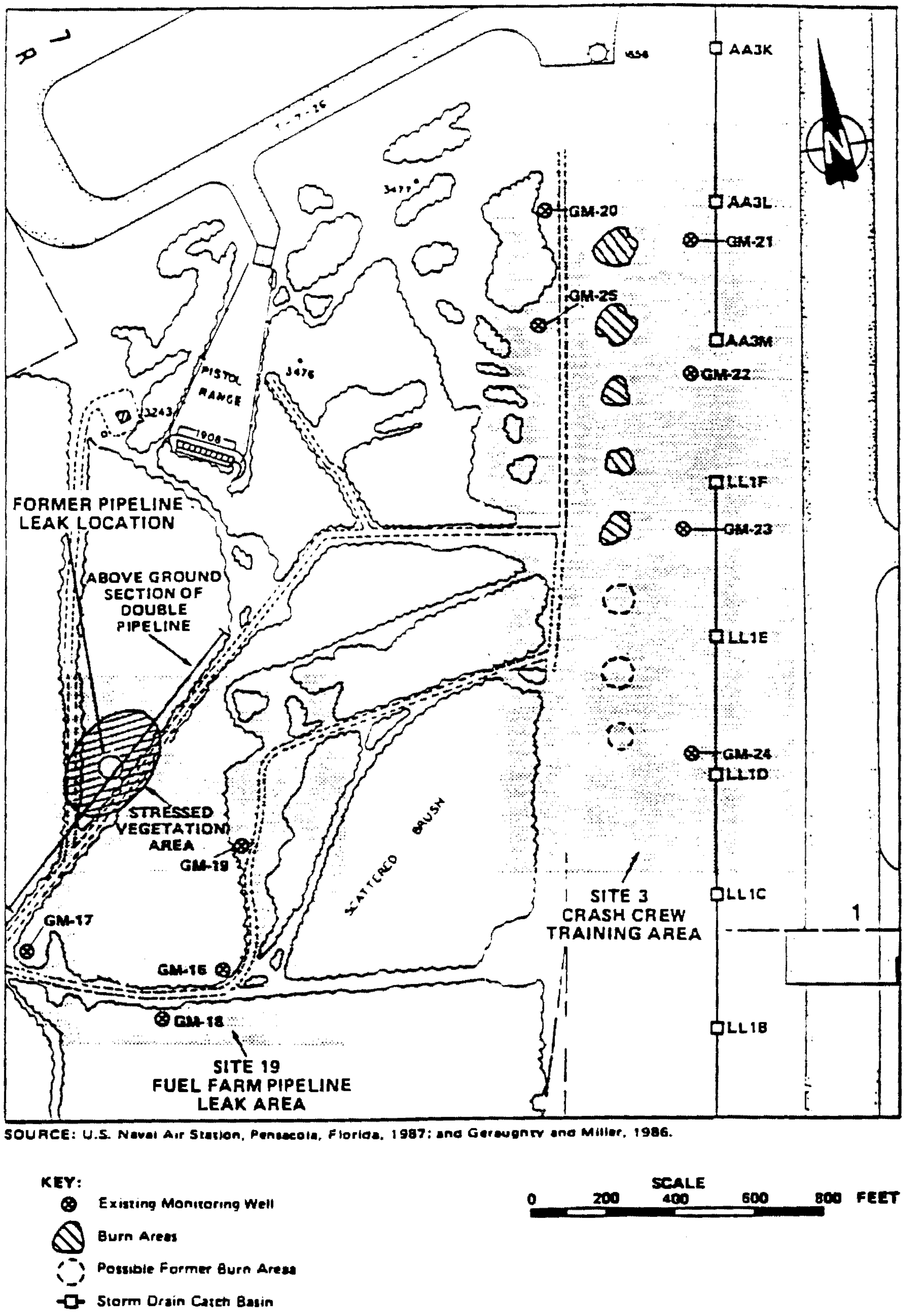
SD001 Sediment Sample Number

SCALE

0 ½ 1 MILE

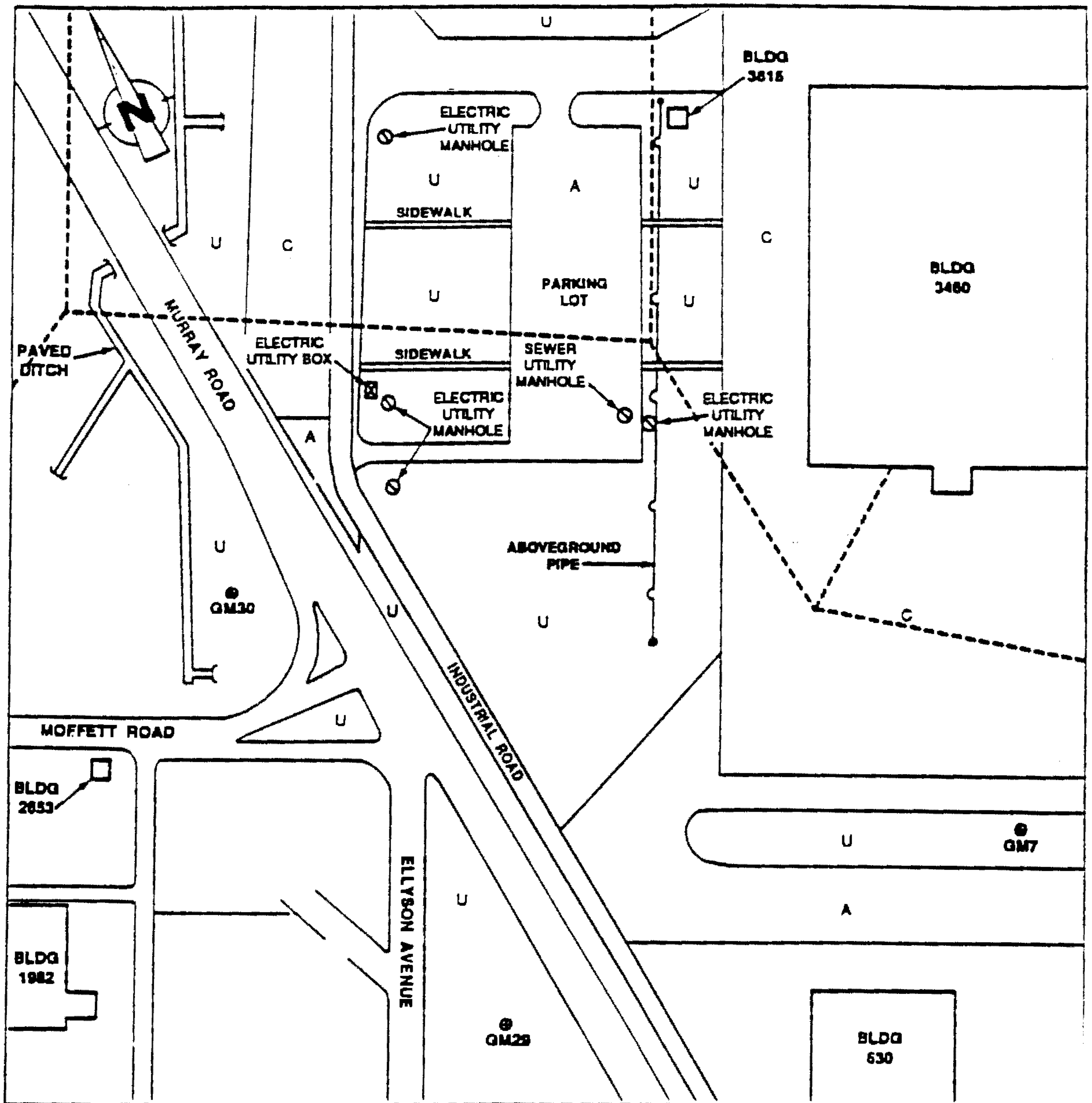
0 .5 1 KILOMETER

OFF-SITE SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS — NAS PENSACOLA SITE 3 — PHASE I



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1987; and Geraughty and Miller, 1986.

SITE MAP NAS PENSACOLA, SITES 3 & 19



SOURCE: U.S. Naval Air Station, Pensacola, Florida 1991; Ecology and Environment, Inc. 1991

KEY:

⊕	Existing Permanent Shallow Monitoring Well	C	Concrete Paved
BLDG 3460	Building	U	Unpaved
A	Asphalt Paved	- - - - - -	Industrial Waste Sewer Line (Site 36)

SITE PLAN MAP — NAS PENSACOLA SITE 9

SUMMARY ANALYTICAL SCREENING RESULTS FOR GROUNDWATER SAMPLES
(FROM TEMPORARY MONITORING WELLS)
NAS PENSACOLA SITE 9
(All results in µg/L, unless noted)

Parameter	Detection Limit	Sample Number (Well Number)							FPDWS/ FSDWS
		P9GW008 (TW008)	P9GW010 (TW010)	P9GW011 (TW011)	P9GW011D[a] (TW011)	P9GW013 (TW013)	P9GW014 (TW014)	P9GW015 (TW015)	
Chromium	10	--	13	--	14	39	12	--	50
Zinc	20	130	100	110	180	85	50	90	5,000
Lead	40	80	61	64	57	84	--	--	50
Copper	25	--	--	110	98	38	--	--	1,000

Key:

FPDWS = Florida Primary Drinking Water Standard.
FSDWS = Florida Secondary Drinking Water Standard.

[a]Duplicate of sample P9GW011.

Dash (--) indicates compound not detected.

Source: Ecology and Environment, Inc., 1992.

SUMMARY ANALYTICAL SCREENING RESULTS FOR SOIL SAMPLES
NAS PENSACOLA SITE 9
(All results in mg/kg, unless noted)

Parameter	Detection Limit	Sample Number (Location and Depth Interval)								
		P9S001A (B001A)	P9S002A (B002A)	P9S002AD[a] (B002A)	P9S003A (B003A)	P9S004A (B004A)	P9S005A (B005A)	P9S006A (B006A)	P9S007A (B007A)	(RCRA) PCAL
Arsenic	6	8.6	--	--	--	--	--	--	--	80
Chromium	1	1.8	1.2	1.9	2.9	1.1	3.6	2.3	5.2	400[b]
Zinc	2	4.3	13	14	16	--	2.2	3.0	11	16,000
Lead	4	14	32	36	32	--	--	12	11	
Cadmium	0.5	--	0.62	--	--	--	--	--	--	40
Nickel	4	13	--	--	--	--	--	--	--	2,000
Copper	2.5	--	2.9	4.3	2.6	--	--	--	4.6	2,500
TRPHs	5	72	10	41	180	5.3	--	--	98	
Total PAHs as Benzo-a-pyrene (µg/kg)	1,000	--	1,400	2,000	--	--	--	--	--	

Key at end of table

(Cont.)

Parameter	Detection Limit	Sample Number (Location and Depth Interval)								(RCRA) PCAL
		P9S008A (B008A)	P9S009A (B009A)	P9S010A (B010A)	P9S011A (B011A)	P9S012A (B012A)	P9S013A (B013A)	P9S014A (B014A)	P9S015A (B015A)	
Arsenic	6	--	7.1	--	--	--	--	--	--	80
Chromium	1	--	1.7	4.7	--	3.4	--	--	--	400[b]
Zinc	2	9.4	3.3	--	4.0	9.2	--	3.5	--	16,000
Lead	4	75	6.7	8.4	--	18	--	--	6.6	
Cadmium	0.5	--	--	--	--	--	--	--	--	40
Nickel	4	--	--	--	--	--	--	--	--	2,000
Copper	2.5	--	--	--	4.9	2.7	--	--	--	2,500
TRPHs	5	59	14	--	9.3	63	--	11	--	
Total PAHs as Benzo-a-pyrene (µg/kg)	1,000	--	--	--	--	--	--	--	--	

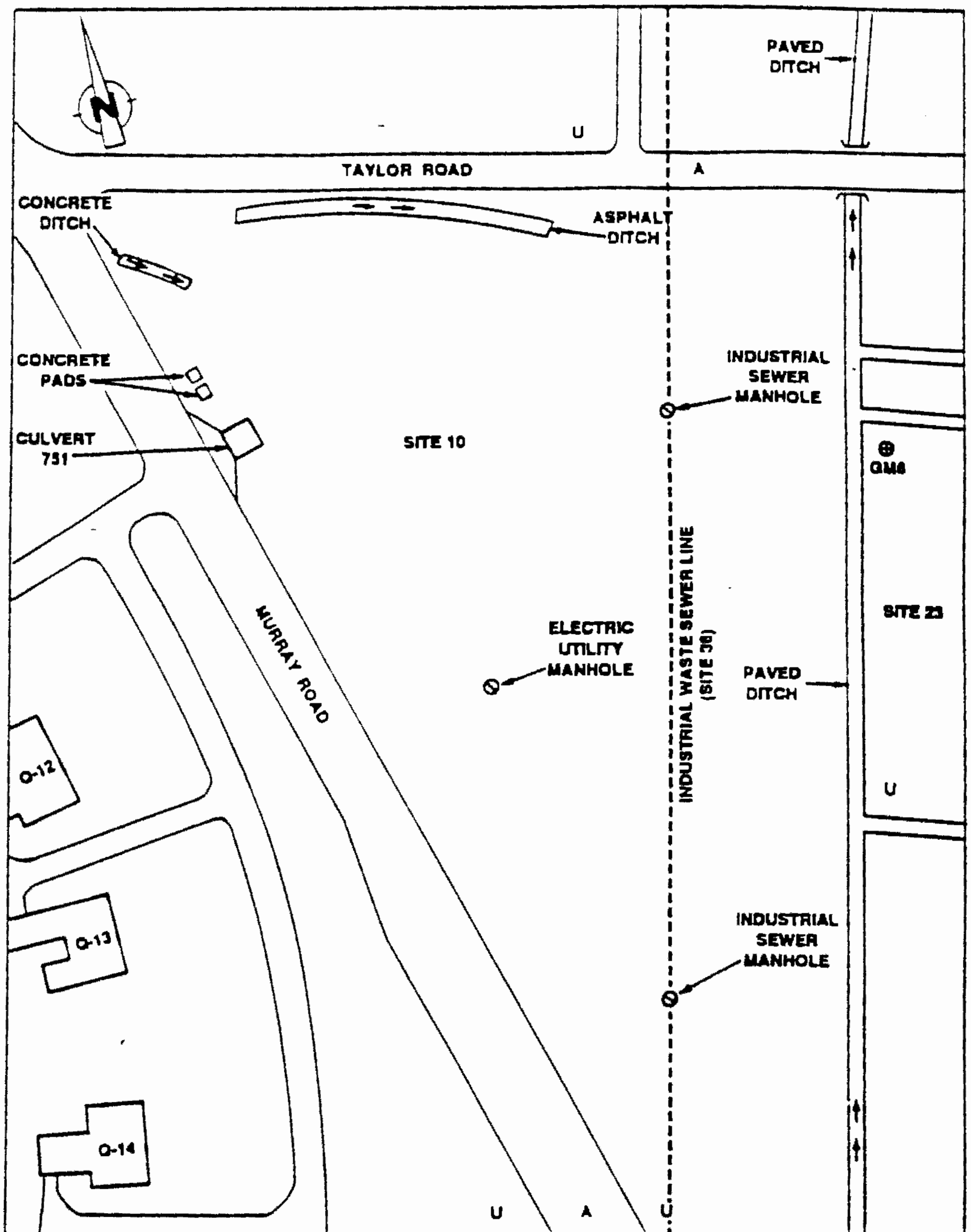
Key:

RCRA PCAL = Resource Conservation and Recovery Act Proposed Corrective Action Levels.

[a] Duplicate of sample P9S002A.
[b] This PCAL is for hexavalent chromium.

Dash (--) indicates compound not detected.

Source: Ecology and Environment, Inc., 1992.



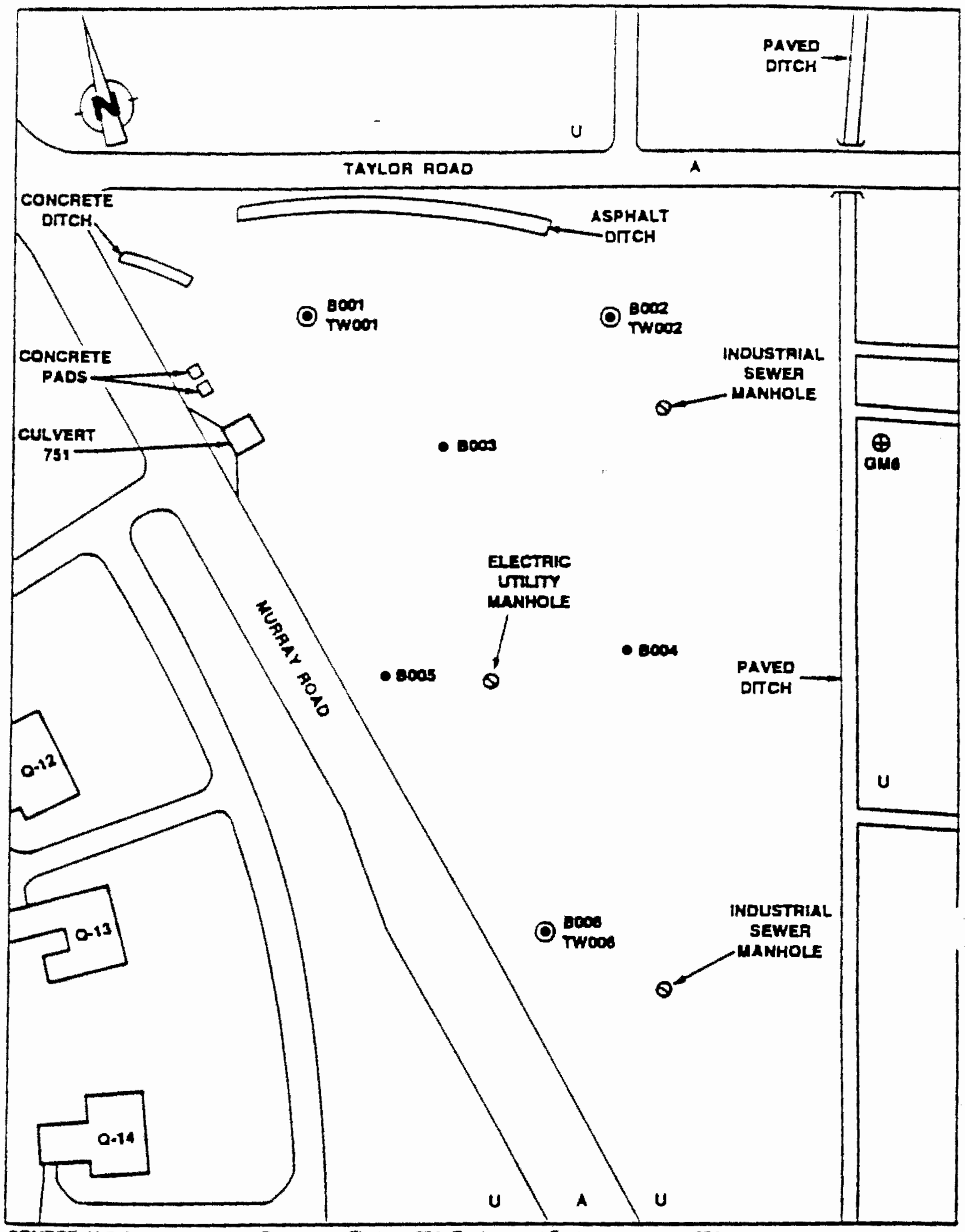
SOURCE: U.S. Naval Air Station, Pensacola, Florida 1990; Ecology and Environment, Inc. 1991

0 100 200 FEET
SCALE

KEY:

Symbol	Meaning	Symbol	Meaning
⊕	Existing Permanent Shallow Monitoring Well	C	Concrete Paved
Q-12	Residential Quarters	U	Unpaved
A	Asphalt Paved	→ →	Flow Direction

SITE PLAN MAP — NAS PENSACOLA SITE 10



SOURCE: U.S. Naval Air Station, Pensacola, Florida 1991; Ecology and Environment, Inc. 1991

0 100 200 FEET
SCALE

KEY:

⊕	Existing Permanent Shallow Monitoring Well	TW001	Temporary Monitoring Well Number
Q-12	Residential Quarters	A	Asphalt Paved
●	Soil Boring	U	Unpaved
B001	Soil Boring Number		
○	Temporary Monitoring Well		

SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS
NAS PENSACOLA SITE 10

SUMMARY ANALYTICAL SCREENING RESULTS FOR GROUNDWATER SAMPLES
(FROM TEMPORARY MONITORING WELLS)
NAS PENSACOLA SITE 10
(All results in µg/L, unless noted)

Parameter	Detection Limit	Sample Number (Well Number) P10GW001 (TW001)	P10GW002 (TW002)	P10GW002D[a] (TW002)	P10GW006 (TW006)	FPDWS/ FSDWS
Chromium	10	450	41	42	20	50
Zinc	20	700	110	120	84	5,000
Lead	40	520	120	120	96	50
Cadmium	5.0	46	--	--	--	10
Nickel	40	420	--	--	--	--
Copper	25	170	--	--	--	1,000
Phenols as Trichlorophenol	100	--	10,000	17,000	--	

Key:

[a]Duplicate of sample P10GW002.
FPDWS = Florida Primary Drinking Water Standard.
FSDWS = Florida Secondary Drinking Water Standard.
Dash (--) indicates compound not detected.

Source: Ecology and Environment, Inc., 1992.

SUMMARY ANALYTICAL SCREENING RESULTS FOR SOIL SAMPLES
NAS PENSACOLA SITE 10
(All results in µg/kg, unless noted)

Parameter	Detection Limit	Sample Number (Location and Depth Interval)							
		P10S001A (B001A)	P10S001AD[a] (B001A)	P10S001B (B001B)	P10S001C (B001C)	P10S002A (B002A)	P10S003A (B003A)	P10S003B (B003B)	RCRA PCAL
Chromium (mg/kg)	1.0	--	--	1.1	--	1.1	--	--	400[b]
Zinc (mg/kg)	2.0	--	--	--	--	--	--	--	16,000
Lead (mg/kg)	4.0	7.6	--	--	--	--	--	--	
TRPHs (mg/kg)	5.0	--	--	--	--	35	--	--	
Total PAHs as Benzo-a-pyrene	1,000	--	--	--	--	1,500	--	--	
Phenols as Trichlorophenol	2,000	--	--	--	--	1,200,000	--	--	

Key at end of table.

(Cont.)

Parameter	Detection Limit	P10S004A (B004A)	P10S005A (B005A)	P10S005B (B005B)	P10S005C (B005C)	P10S005D (B005D)	P10S006A (B006A)	RCRA PCAL
		Sample Number (Location and Depth Interval)						
Chromium (mg/kg)	1.0	--	--	--	1.6	--	--	400[b]
Zinc (mg/kg)	2.0	3.0	2.5	--	--	--	--	16,000
Lead (mg/kg)	4.0	--	--	--	--	--	5.8	
TRPHs (mg/kg)	5.0	13	13	23	12	31	8.2	
Total PAHs as Benzo-a-pyrene	1,000	--	--	--	--	--	--	
Phenols as Trichlorophenol	2,000	3,800	--	--	40,000	--	--	

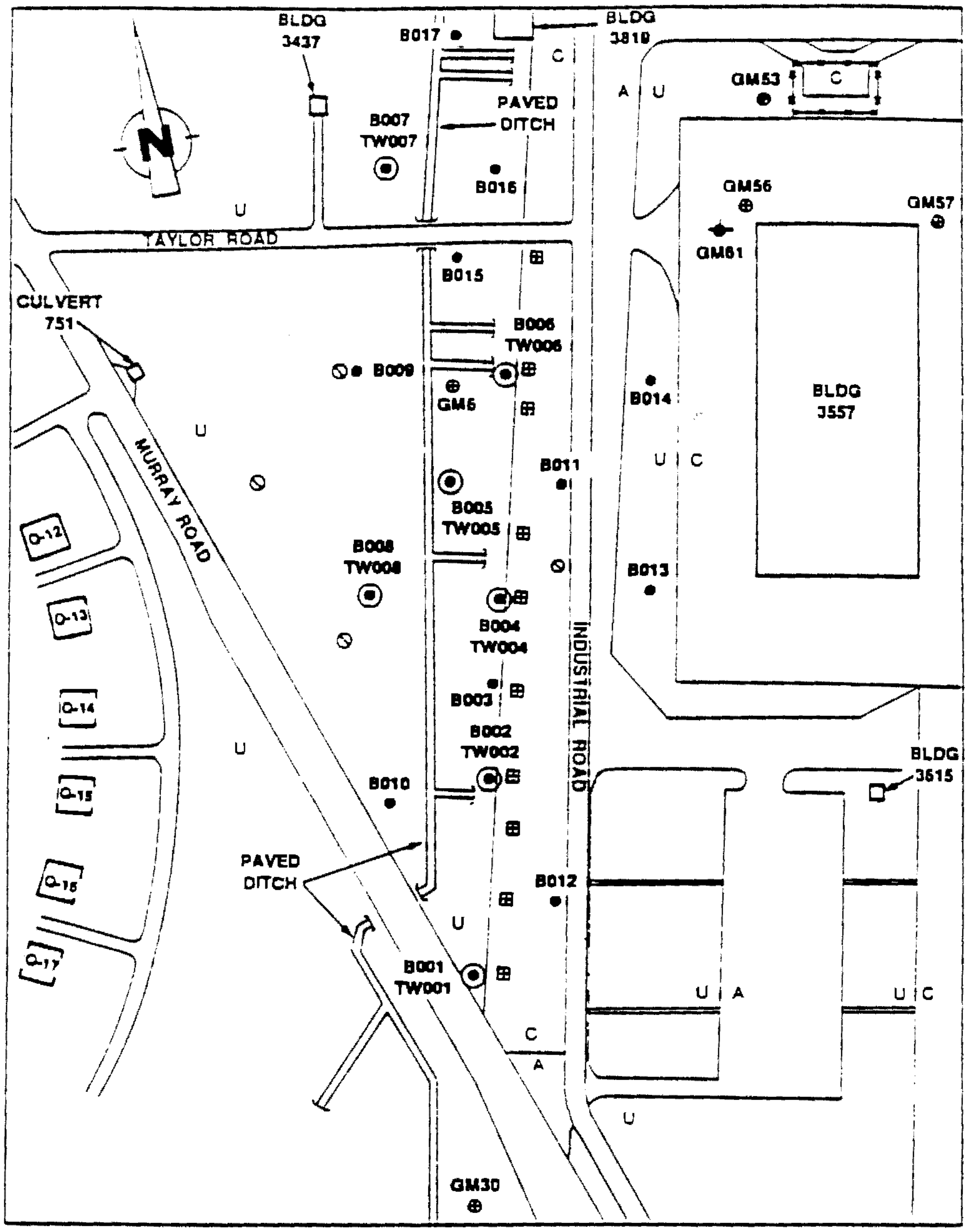
Key:

[a]Duplicate of sample P10S001A.
[b]This PCAL is for hexavalent chromium.

RCRA PCAL = Resource Conservation and Recovery Act Proposed Corrective Action Level.

Dash (--) indicates compound not detected.

Source: Ecology and Environment, Inc., 1992.



SOURCE: U.S. Naval Air Station, Pensacola, Florida 1991; Ecology and Environment, Inc. 1991

0 200 400 FEET
SCALE

KEY:

- Soil Boring
- Temporary Monitoring Well
- Existing Permanent Shallow Monitoring Well
- Existing Permanent Deep Monitoring Well
- Manhole
- Steel Grate
- BLDG 3557 Building
- Q-12 Residential Quarters
- Fence
- U Unpaved Area
- A Asphalt Paved Area
- C Concrete Paved Area

SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS
NAS PENSACOLA SITE 23

SUMMARY ANALYTICAL SCREENING RESULTS FOR SOIL SAMPLES
NAS PENSACOLA SITE 23
(All results in μg/kg, unless noted)

Parameter	Detection Limit	Sample Number (Location and Depth Interval) P23S001A (B001A)	P23S001AD[a] (B001A)	P23S002A (B002A)	P23S003A (B003A)	P23S004A (B004A)	P23S005A (B005A)	RCRA PCAL
Arsenic (mg/kg)	6.0	8.0	--	--	--	--[b]	--[b]	80
Chromium (mg/kg)	1.0	180	5.6	--	--	--	--	400[c]
Zinc (mg/kg)	2.0	340	300	5.9	3.5	--	3.1	16,000
Lead (mg/kg)	4.0	190	500	--	--	--	10	
Cadmium (mg/kg)	0.50	1.2	0.96	--	--	0.85	--	40
Nickel (mg/kg)	4.0	5.1	4.1	--	--	--	--	2,000
Copper (mg/kg)	2.5	150	110	--	--	--	--	2,500
Silver (mg/kg)	1	1.0	--	--	--	--	--	200
TRPHs (mg/kg)	5.0	6.9	--	--	--	10	--	
Total PAHs as Benzo-a-pyrene	1,000	6,000	6,500	--	--	--	--	
Phenols as Trichlorophenol	2,000	--	--	--	--	--	--	

Key at end of table.

(Cont.)

Parameter	Detection Limit	Sample Number (Location and Depth Interval)						RCRA PCAL
		P23S006A (B006A)	P23S007A (B007A)	P23S008A (B008A)	P23S009A (B009A)	P23S010A (B010A)	P23S011A (B011A)	
Arsenic (mg/kg)	6.0	--[b]	--[b]	--[b]	--[b]	--[b]	--	80
Chromium (mg/kg)	1.0	--	--	--	--	--	--	400[c]
Zinc (mg/kg)	2.0	3.6	--	2.3	4.2	19	2.0	16,000
Lead (mg/kg)	4.0	--	8.8	9.6	15	29	--	
Cadmium (mg/kg)	0.50	--	--	--	--	--	--	40
Nickel (mg/kg)	4.0	--	--	--	--	--	--	2,000
Copper (mg/kg)	2.5	--	--	--	--	4.9	--	2,500
Silver (mg/kg)	1	--	--	--	--	--	--	200
TRPHs (mg/kg)	5.0	13	5.7	18,000	--	20	730	
Total PAHs as Benzo-a-pyrene	1,000	--	--	35,000[d]	--	--	--	
Phenols as Trichlorophenol	2,000	--	--	59,000[e]	--	--	--	

Key at end of table.

. (Cont.)

Parameter	Detection Limit	Sample Number (Location and Depth Interval) P23S012A (B012A)	P23S013A (B013A)	P23S014A (B014A)	P23S015A (B015A)	P23S016A (B016A)	P23S017A (B017A)	RCRA PCAL
Arsenic (mg/kg)	6.0	--	--	--	6.4	--	--	80
Chromium (mg/kg)	1.0	--	4.1	4.4	--	1.5	8.1	400[c]
Zinc (mg/kg)	2.0	4.2	4.6	5.2	--	2.6	2.1	16,000
Lead (mg/kg)	4.0	--	9.3	8.5	--	--	--	
Cadmium (mg/kg)	0.50	--	--	--	--	--	0.90	40
Nickel (mg/kg)	4.0	--	--	--	--	--	--	2,000
Copper (mg/kg)	2.5	--	--	--	--	--	--	2,500
Silver (mg/kg)	1	--	--	--	--	--	--	200
TRPHs (mg/kg)	5.0	410	--	--	--	19	10	
Total PAHs as Benzo-a-pyrene	1,000	--	--	--	--	--	--	
Phenols as Tricholorophenol	2,000	--	--	--	--	--	--	

Key:

RCRA PCAL = Resource Conservation and Recovery Act Proposed Corrective Action Level.
[a]Duplicate of sample P23S001A.
[b]The detection limit for arsenic was 6.9 mg/kg in this sample.
[c]This PCAL is for hexavalent chromium.
[d]The detection limit for this parameter increased by a factor of 12 in this sample.
[e]The detection limit for this parameter increased by a factor of 2 in this sample.

Dash (--) indicates compound not detected.

Source: Ecology and Environment, Inc., 1992.

SUMMARY ANALYTICAL SCREENING RESULTS FOR GROUNDWATER SAMPLES
(FROM TEMPORARY MONITORING WELLS)
NAS PENSACOLA SITE 23
(All results in µg/L, unless noted)

Parameter	Detection Limit	Sample Number (Well Number)								FPDWS/ FSDWS
		P23GW001 (TW001)	P23GW002 (TW002)	P23GW002D[a] (TW002D)	P23GW004 (TW004)	P23GW005 (TW005)	P23GW006 (TW006)	P23GW007 (TW007)	P23GW008 (TW008)	
Arsenic	60	89	98	--	--	--	85	--	--	50
Chromium	10	210	20	13	68	84	20	--	22	50
Zinc	20	48,000	220	240	360	530	93	--	61	5,000
Lead	40	35,000	340	460	390	270	--	--	--	50
Cadmium	5.0	110	--	--	--	6.7	--	--	--	10
Nickel	40	360	--	--	--	40	--	--	--	
Copper	25	10,000	95	100	44	62	--	--	--	1,000
Silver	10	57	--	--	--	--	--	--	--	50
TRPHs (mg/L)	1.0	--	--	--	--	--	--	--	4.9	
Total PAHs as Benzo-a-pyrene	100	--	--	--	--	--	--	--	(L)	
Phenols as Trichlorophenol	100	--	--	--	--	370	--	--	--	

Key:

[a]Duplicate of sample P23GW002.

Dash (--) indicates compound not detected.

(L) = Present below stated detection limit.

Source: Ecology and Environment, Inc., 1992.

SUMMARY TAL/TCL ANALYTICAL RESULTS FOR GROUNDWATER AND FIELD QA/QC SAMPLES (FROM PERMANENT MONITORING WELLS)
NAS PENSACOLA SITE 23
(All results in μg/L, unless noted)

Parameter	Detection Limit	Sample Number (Well Number/Type)						FPDWS/ FSDWS
		P23W006 (GM6)	P23W006D[a] (GM6)	P23WTB03[b] (Trip Blank)	P23WFB03 (Field Blank)	P23WRB03[c] (Rinsate Blank)	P23WPB03[d] (Preservative Blank)	
Total Metals								
Aluminum	14	471	551	NA	17.2(B)	22.2(B)	15.3(B)	
Barium	5.0	5.4(B)	5.6(B)	NA	--	--	--	1,000
Calcium	95	16,600	16,600	NA	111(B)	115(B)	--	
Iron	5.0	814(E)	1,040(E)	NA	25.6(B,E)	24.2(B,E)	48.8(B,E)	300
Lead	1.0	2.3(B)	2.9(B)	NA	2.2(B)	--	--	50
Magnesium	108	1,720(B)	1,740(B)	NA	--	--	--	
Manganese	1.0	4.8(B)	7.0(B)	NA	--	--	--	50
Potassium	263	1,170(B)	1,240(B)	NA	--	--	--	
Sodium	74	4,840(B)	5,020	NA	555(B)	274(B)	181(B)	160,000
Zinc	3.0	5.2(B)	11.4(B)	NA	5.0(B)	3.9(B)	4.8(B)	5,000
Dissolved Metals								
Aluminum	14	57.4(B)	60.1(B)	NA	101(B)	24.9(B)	NA	
Antimony	33	33.2(B)	--	NA	--	--	NA	
Cadmium	3.0	4.2(B)	--	NA	--	--	NA	10
Calcium	95	16,500	16,600	NA	127(B)	132(B)	NA	
Copper	2.0	2.1(B)	--	NA	--	--	NA	1,000
Iron	5.0	62.6(B,E)	55.3(B,E)	NA	156(E)	29.1(B,E)	NA	300
Lead	1.0	1.1(B)	--	NA	--	--	NA	50
Magnesium	108	1,680(B)	1,680(B)	NA	251(B)	--	NA	
Manganese	1.0	3.3(B)	3.7(B)	NA	3.5(B)	1.1(B)	NA	50
Nickel	8.0	--	--	NA	10.7(B)	--	NA	
Potassium	263	1,260(B)	1,260(B)	NA	--	--	NA	
Sodium	74	4,940(B)	4,950(B)	NA	438(B)	331(B)	NA	160,000
Zinc	3.0	9.8(B)	9.3(B)	NA	6.2(B)	3.0(B)	NA	5,000
TRPHs (mg/L)	1.0	1.6	--	NA	--	--	--	

Key at end of table.

(Cont.)

Parameter	Detection Limit	Sample Number (Well Number/Type)						FPDWS FSDWS
		P23W006 (GM6)	P23W006D[a] (GM6)	P23WTB03[b] (Trip Blank)	P23WFB03 (Field Blank)	P23WRB03[c] (Rinsate Blank)	P23WPB03[d] (Preservative Blank)	
Methylene Chloride	5	6(B[a])	5(B[a])	2(B[a],J)	7(B[a])	7(B[a])	5(B[a])	
Acetone	10	8(J)	10	6(J)	--	--	--	
Bis(2-Ethylhexyl) Phthalate	10	5(B[a],J)	5(B[a],J)	NA	4(B[a],J)	2(B[a],J)	NA	
Aroclor - 1254	1.0	--	--	NA	--	0.84(J)	NA	
Tentatively Identified Compounds*								
Hexane		12(J)	6(J)	5(B[a],J)	11(J)	13(J)	6(J)	
Unknown Siloxane		--	--	--	(2)13(J)	(2)31(J)	--	
Dibutyl Phenol Isomer		7(J)	6(J)	--	10(J)	4(J)	--	
Unknown Hydrocarbon		(5)37(J)	(4)37(J)	--	17(J)	8(J)	--	
Unknown Compound		40(B[a],J)	61(B[a],J)	--	53(B[a],J)	48(B[a],J)	--	
Unknown Compound		(4)63(J)	(5)65.7(J)	--	(3)30(J)	40(J)	12(J)	
Total Alkalinity (mg/L as $CaCO_3$)	1.0	30	30	NA	5.0	NA	NA	
Total Hardness (mg/L as $CaCO_3$)	1.0	42	42	NA	--	--	--	
Total Organic Carbon (mg/L)	1.0	2.2	1.8	NA	--	NA	NA	

Key at end of table.

(Cont.)

Note: The number within parentheses preceding the concentration is the number of tentatively identified compounds (TICs) in this parameter group. The listed concentration represents the sum of the individual group-member concentrations.

Key:

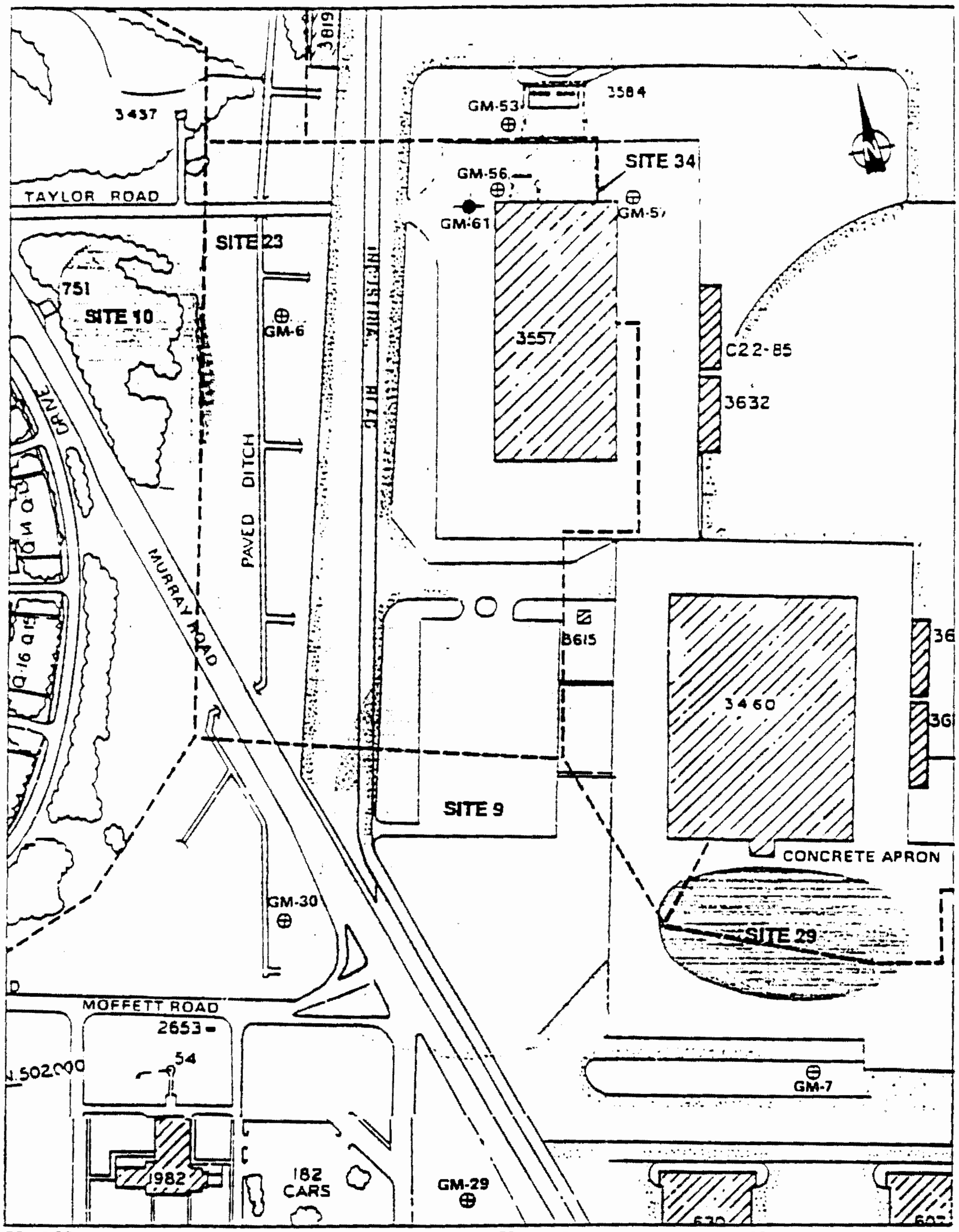
FPDWS = Florida Primary Drinking Water Standard.
FSDWS = Florida Secondary Drinking Water Standard.

NA = Analyses not performed.
Dash (--) indicates compound not detected.

[a]Duplicate of sample P23W006.
[b]Analyzed for VOCs only.
[c]Analyzed for total metals, dissolved metals, cyanide, VOCs, BNAs, pesticides, PCBs, and TRPHs.
[d]Analyzed for dissolved metals, cyanide, VOCs, and TRPHs only.
*Values for TICs are estimated; no detection limits were established for TICs.

Qualifiers:
(B) = Reported value was obtained from a reading that was less than the Contract Required Detection Limit but greater than or equal to the Instrument Detection Limit.
(B[a]) = Present in method blank.
(E) = Reported value is estimated because of the presence of interference.
(J) = For nonTICs estimated value; compound present but below detection limit. Also indicates that TIC concentrations are estimated because no detection limits were established.

Source: Ecology and Environment, Inc., 1992.



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1986 and 1988; and Geraughty and Miller, 1986.

SCALE

0 200 400 600 800 FEET

KEY:

⊕ Existing Permanent Shallow Monitoring Well

Existing Permanent Deep Monitoring Well

Industrial Waste Sewer Line

Building

SITE VICINITY MAP — NAS PENSACOLA SITES 9, 10, 23, 29, 34, AND 36

SUMMARY ANALYTICAL SCREENING RESULTS FOR SOIL SAMPLES
NAS PENSACOLA SITE 29
(All results in mg/kg, unless noted)

		Sample Number (Location and Depth Interval)									
Parameter	**Detection Limit**	**P29S001A (B001A)**	**P29S001AD[a] (B001A)**	**P29S002A (B002A)**	**P29S003A (B003A)**	**P29S004A (B004A)**	**P29S005A (B005A)**	**P29S006A (B006A)**	**P29S007A (B007A)**	**P29S008A (B008A)**	**RCRA PCAL**
Chromium	1.0	—	1.4	—	—	—	—	2.0	2.4	—	400[b]
Zinc	2.0	9.9	7.8	3.2	—	—	—	2.4	—	2.0	16,000
Lead	4.0	17	12	—	—	—	—	9.5	—	—	
TRPHs	5.0	29	59	74	—	—	—	—	—	—	
Total PAHs as Benzo-a-pyrene (µg/kg)	1,000	—	—	—	—	—	—	6,200	—	—	

Key:

[a] Duplicate of sample P29S001A.
[b] This PCAL is for hexavalent chromium.

RCRA PCAL = Resource Conservation and Recovery Act Proposed Corrective Action Level.

Dash (—) indicates compound not detected.

Source: Ecology and Environment, Inc., 1992.

SUMMARY ANALYTICAL SCREENING RESULTS FOR GROUNDWATER SAMPLES
(FROM TEMPORARY MONITORING WELLS)
NAS PENSACOLA SITE 29
(All results in μg/L, unless noted)

Parameter	Detection Limit	Sample Number (Well Number)				FPDW FSDW
		P29GW006 (TW006)	P29GW007 (TW007)	P29GW007D[a] (TW007)	P29GW008 (TW008)	
Arsenic	60	--	--	110	--	[illegible]
Chromium	10	26	34	26	23	[illegible]
Zinc	20	58	38	66	46	5,0[illegible]
Nickel	40	--	42	--	--	
TRPHs (mg/L)	1	11	2.6	5.7	12	
Methylene Chloride	10	--	--	--	100[b]	

Key:

[a]Duplicate of sample P29GW007.
[b]The detection limit for this parameter increased by a factor of 10 in this sample.
FPDWS = Florida Primary Drinking Water Standard.
FSDWS = Floride Secondary Drinking Water Standard.

Dash (--) indicates compound not detected.

Source: Ecology and Environment, Inc., 1992.

SUMMARY TAL/TCL ANALYTICAL RESULTS FOR GROUNDWATER AND FIELD QA/QC SAMPLES
(FROM PERMANENT MONITORING WELLS)
NAS PENSACOLA SITE 29
(All results in µg/L, unless noted)

Parameter	Detection Limit	Sample Number (Well Number/Type)						FPDWS/ FSDWS
		P29W007 (GM7)	P29W007D[a] (GM7)	P29WTB04[b] (Trip Blank)	P29WFB04 (Field Blank)	P29WRB04[c] (Rinsate Blank)	P29WPB04[d] (Preservative Blank)	
Total Metals								
Aluminum	14	246	61.2(B)	NA	41.4(B)	35(B)	30.4(B)	
Barium	5	161(B)	147(B)	NA	--	--	--	1,000
Calcium	95	32,700	32,900	NA	--	188(B)	121(B)	
Chromium	10	103	37	NA	16	12.5	41.1	50
Cobalt	5	8.8(B)	9.3(B)	NA	6.8(B)	7.1	5.9(B)	
Copper	2	3.2(B)	--	NA	--	--	--	1,000
Iron	19	1,350(E)	954(E)	NA	106(E)	108(E)	220(E)	300
Lead	1.0	3.8(S)	1.1(B)	NA	1.6(B,W)	--(W)	1.5(B,W)	50
Magnesium	108	1,780	1,780(B)	NA	--	--	--	
Manganese	1	289(E)	149(E)	NA	2.7(B,E)	3.0(B,E)	4.8(B,E)	50
Nickel	14	19.4	--	NA	--	--	--	
Potassium	263	3,010	2,930(B)	NA	--	--	--	
Sodium	74	27,100	27,000	NA	174(B)	422(B)	218(B)	160,000
Vanadium	4	4.2	4.4(B)	NA	--	--	--	
Zinc	3	12.9	8.4(B)	NA	5.5(B)	5.4(B)	12.2(B)	5,000

Key at end of table.

(Cont.)

Parameter	Detection Limit	P29W007 (GM7)	P29W007D[a] (GM7)	P29WTB04[b] (Trip Blank)	P29WFB04 (Field Blank)	P29WRB04[c] (Rinsate Blank)	P29WPB04[d] (Preservative Blank)	FPDWS/ FSDWS
		Sample Number (Well Number/Type)						
Dissolved Metals								
Aluminum	14	151(B)	236	NA	50.6(B)	66.1(B)	NA	
Barium	5	141(B)	147(B)	NA	--	--	NA	1,000
Calcium	95	33,600	33,500	NA	102(B)	103(B)	NA	
Chromium	10	--	109	NA	148	116	NA	50
Cobalt	5	12.4(B)	11.8(B)	NA	8.5(B)	7.9(B)	NA	
Copper	2.0	5.0(B)	3.6(B)	NA	3.9(B)	--	NA	1,000
Iron	19	287(E)	849(E)	NA	631(E)	481(E)	NA	300
Lead	1.0	1.1(B,W)	1.4(B,W)	NA	--	1.4(B)	NA	50
Magnesium	108	1,840(B)	1,810(B)	NA	--	--	NA	
Manganese	1	165(E)	181(E)	NA	15.5(E)	11.9(B,E)	NA	50
Nickel	14	--	22.4(B)	NA	37.6(B)	25.8(B)	NA	
Potassium	263	3,170(B)	3,220(B)	NA	--	--	NA	
Sodium	74	28,200	27,700	NA	211(B)	244(B)	NA	160,000
Vanadium	4.0	5.6(B)	6.1(B)	NA	4.8(B)	4.2(B)	NA	
Zinc	3.0	9.0(B)	13.0(B)	NA	6.7(B)	--	NA	5,000
TRPHs (mg/L)	1.0	--	1.2	NA	--	--	--	
Methylene Chloride	5.0	6(B[a])	1(B[a],J)	--	6(B[a])	4(B[a],J)	1(B[a],J)	
Acetone	10	14(B[a])	13	12	--	--	15	
Bis(2-Ethylhexyl)Phthalate	10	3(B[a],J)	3(B[a],J)	NA	3(B[a],J)	3(B[a],J)	NA	

Key at end of table.

(Cont.)

Parameter	Detection Limit	Sample Number (Well Number/Type): P29W007 (GM7)	P29W007D[a] (GM7)	P29WTB04[b] (Trip Blank)	P29WFB04 (Field Blank)	P29WRB04[c] (Rinsate Blank)	P29WPB04[d] (Preservative Blank)	FPDWS/ FSDWS
Tentatively Identified Compounds*								
Hexane		6.0(J)	6.0(B[a],J)	6.0(B[a],J)	5(J)	--	6.0(B[a],J)	
Unknown Hydrocarbon		(3)44(J)	(2)8(J)	--	(3)28(J)	4(J)	--	
Unknown Hydrocarbon		(2)10(B[a],J)	(3)20(B[a],J)	--	(2)12(B[a],J)	(2)12(B[a],J)	--	
Unknown Compound		(4)28.0(J)	(3)45(J)	--	31(J)	(3)49(J)	--	
Unknown Compound		30(B[a],J)	41(B[a],J)	--	35(B[a],J)	33(B[a],J)	--	
Total Alkalinity (mg/L as $CaCo_3$)	1.0	100	100	NA	5.0	NA	NA	
Total Hardness (mg/L as $CaCo_3$)	1.0	88	82	NA	2.0	--	--	
Total Organic Carbon (mg/L)	1.0	4.4	5.0	NA	--	NA	NA	
Gross Alpha Radioactivity (pCi/L)	1	NA	NA	NA	NA	NA	NA	

Key at end of table.

(Cont.)

Note: The number within parentheses preceding the concentration is the number of tentatively identified compounds (TICs) in this parameter group. The listed concentration represents the sum of the individual group-member concentrations.

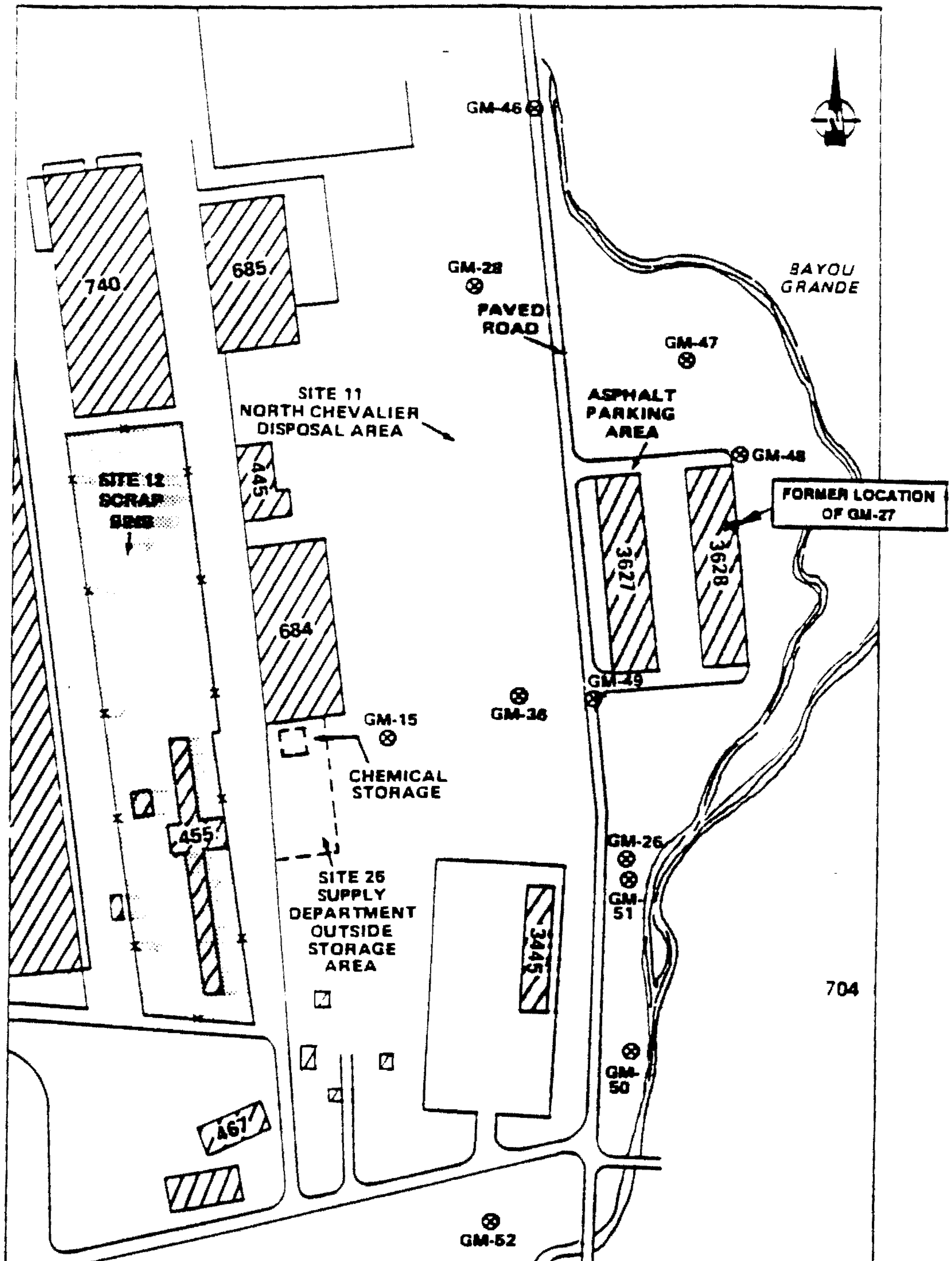
Key:

NA = Analyses not performed.
Dash (—) indicates compound not detected.
*Values for TICs are estimated. No detection limits were established.

[a]Duplicate of sample P29W007.
[b]Analyzed for VOCs only.
[c]Analyzed for total metals, dissolved metals, cyanide, VOCs, BNAs, pesticides, PCBs, and TRPHs.
[d]Analyzed for dissolved metals, cyanide, VOCs, and TRPHs only.

Qualifiers:
(B) = Reported value was obtained from a reading that was less than the Contract Required Detection Limit but greater than or equal to the Instrument Detection Limit.
(B[a]) = Present in method blank.
(E) = Reported value is estimated because of the presence of interference.
(J) = For nonTICs estimated value; compound present but below detection limit. Also indicates that TIC concentrations are estimated because no detection limits were established.
(S) = The reported value was determined by the method of standard additions.
(W) = Post digestion spike for furnace AA analysis is out of control limits (85-115%), while sample absorbance is less than 50% of spike absorbance.

Source: Ecology and Environment, Inc., 1992.



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1988; and Geraughty and Miller, 1986.

SCALE

0 100 200 400 600 FEET

KEY:

⊗ Existing Monitoring Well

▨ Building

SITE MAP — NAS PENSACOLA SITES 11, 12, AND 26

SUMMARY OF CHEMICAL ANALYSES OF GROUNDWATER SAMPLES
SITES 11 AND 26 TAKEN IN 1984
(ug/L)

	Well Numbers				
Compound	GM-15	GM-26	GM-27	GM-28	GM-36
Methylene chloride	TR	TR	--	TR	--
Trans-1,2-dichloroethene	--	--	--	TR	--
Chloroform	--	22	--	--	--
1,1,1-trichloroethane	--	TR	--	--	--
Trichloroethane	TR	TR	--	TR	--
1,2-dichloroethane	TR	--	--	--	--
Tetrachloroethene	TR	--	--	--	--
Benzene	--	--	--	--	--
Toluene	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--
Ethyl Benzene	--	--	--	--	--
1,1-dichloroethane	--	--	--	--	--
TOTAL VOLATILES	11	32	0	10	0

Note: -- = Not Detected
TR = Trace [<10 ug/L (ppb)]

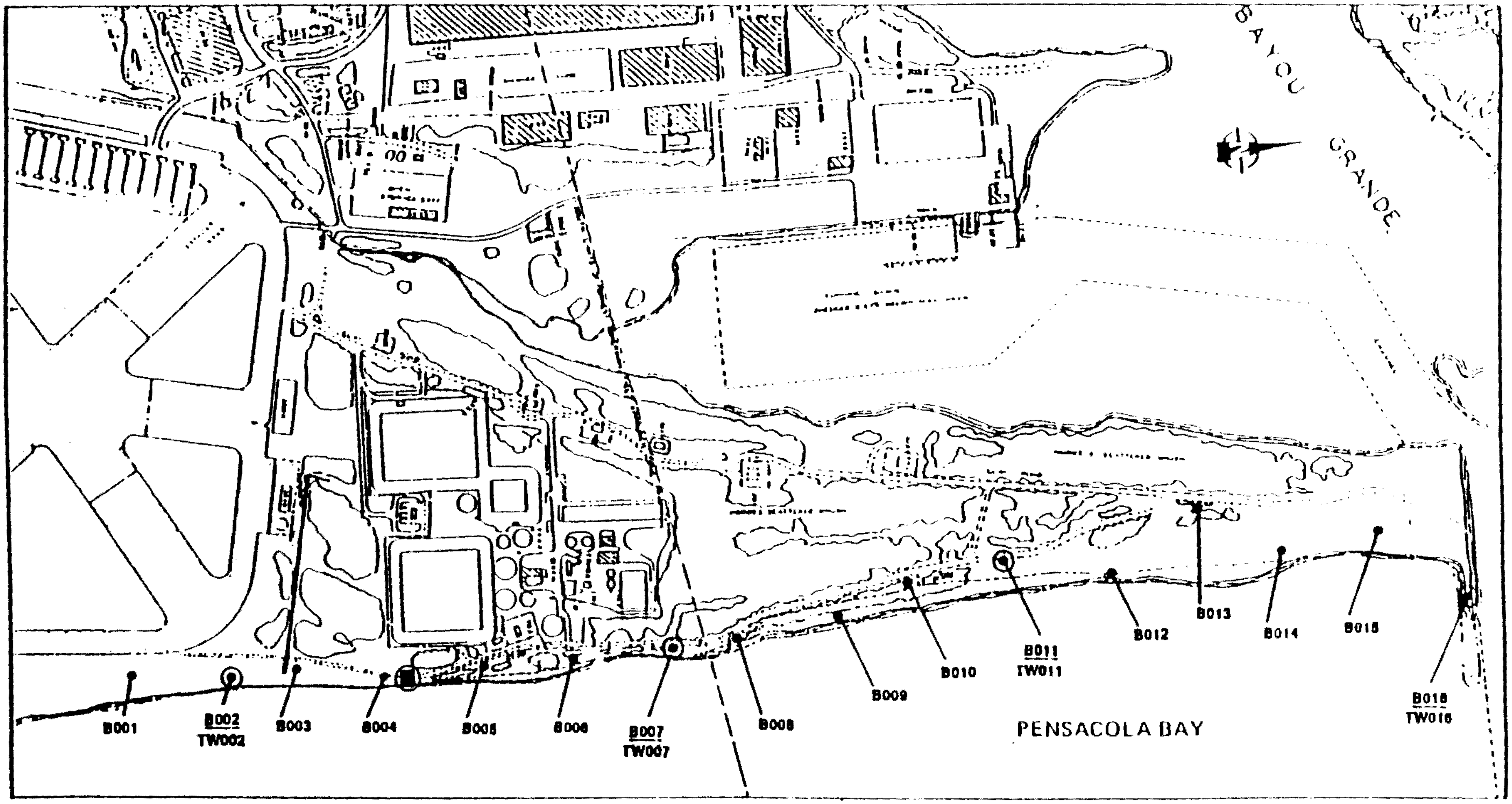
Source: G & M 1986

SUMMARY OF CHEMICAL ANALYSES OF GROUNDWATER SAMPLES
FROM SITES 11 AND 26 TAKEN IN 1986
(ug/L)

Compound	Well Number (GM-)									
	26	28	36	46	47	48	49	50	51	52
Methylene chloride	--	--	--	--	--	--	--	--	--	--
Trans-1,2-dichloroethene	TR	TR	--	--	TR	--	--	39	--	530
Chloroform	--	TR	--	--	--	--	--	--	--	--
1,1,1-trichloroethane	--	--	--	--	--	--	--	--	--	--
Trichloroethene	--	--	--	--	--	--	--	--	--	21
1,2-dichloroethane	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene	--	--	--	--	--	--	--	--	--	--
Benzene	32	21	--	--	59	18	--	TR	TR	--
Toluene	TR	TR	--	--	21	--	--	--	--	--
Vinyl Chloride	16	54	--	--	14	TR	--	390	TR	73
Ethyl Benzene	--	--	--	--	33	--	--	--	--	--
1,1-dichloroethane	--	--	--	--	--	--	--	TR	--	--
TOTAL VOLATILES	65	94	--	--	132	27	--	437	4	813
Lead	--	--	--	--	--	--	--	--	69	
NT										
Mercury	--	--	--	--	27	--	--	--	--	NT

Note: -- = Not detected
TR = Trace [<10 ug/L]
NT = Not tested

Source: G & M 1986



SOURCE: U.S. Naval Air Station, Pensacola, Florida 1987 and 1988; Ecology and Environment, Inc., 1991

SCALE

0 200 400 600 800 1000 FEET

KEY:

○ Temporary Monitoring Well

● Soil Boring

Asbestos Sample

TW007 Temporary Monitoring Well 007

B007 Soil Boring 007

ASBESTOS SAMPLE, TEMPORARY MONITORING WELL, AND SOIL BORING LOCATIONS — NAS PENSACOLA SITE 13

SUMMARY ANALYTICAL SCREENING RESULTS FOR SOIL SAMPLES
NAS PENSACOLA SITE 13
(All results in µg/kg, unless noted)

Parameter	[Detection Limit	Sample Number (Location)							
		P13S001A (B001A)	P13S002A (B002A)	P13S002AD[a] (B002AD)	P13S003A (B003A)	P13S004A (B004A)	P13S004B (B004B)	P13S005A (B005A)	P13S005B (B005B)
Chromium (mg/kg)	1	1.3	--	--	--	5.8	--	12	--
Zinc (mg/kg)	2	--	--	2.0	2.5	7.9	--	16	7.3
Lead (mg/kg)	4	--	--	12	--	--	--	--	--
Cadmium (mg/kg)	0.5	--	--	0.92	0.72	1.2	--	1.6	--
Copper (mg/kg)	2.5	--	--	--	--	2.7	--	6.1	--
TRPHs (mg/kg)	5	22	31	26	20	570	61	2,800	210
Methylene Chloride	1,000	--	12,000(B)	4,300(B)	--	5,300	3,900	3,700	3,300
Total PAHs as Benzo-a-pyrene	1,000	(L)	1,600	2,200	(L)	28,000	--	12,000	--
Phenols as Trichlorophenol	2,000]	--	--	--	--	58,000	--	24,000	(L)

Key at end of table.

(Cont.)

Parameter	Detection Limit	Sample Number (Location)							
		P13S006A (B006A)	P13S006B (B006B)	P13S007A (B007A)	P13S007B (B007B)	P13S008A (B008A)	P13S009A (B009A)	P13S010A (B010A)	P13S011A (B011A)
Chromium (mg/kg)	1	0.0	3.6	1.4	--	--	--	--	--
Zinc (mg/kg)	2	0.5	--	--	--	--	--	--	3.1
Lead (mg/kg)	4	--	8.7	--	--	--	--	--	--
Cadmium (mg/kg)	0.5	--	--	--	--	--	--	--	--
Copper (mg/kg)	2.5	--	--	--	--	--	--	--	--
TRPHs (mg/kg)	5	480	92	8.1	13	12	7.7	8.4	17
Methylene Chloride	1,000	--	--	--	--	--	--	1,000	4,300(B)
Total PAHs as Benzo-a-pyrene	1,000	17,000	(L)	(L)	--	(L)	--	--	--
Phenols as Trichlorophenol	2,000	--	--	--	--	--	--	--	--

Key at end of table.

(Cont.)

Parameter	Detection Limit	P13S012A (B012A)	P13S012B (B012B)	P13S013A (B013A)	P13S013B (B013B)	P13S014A (B014A)	P13S015A (B015A)	P13S015B (B015B)	P13S016A (B016A)
		Sample Number (Location)							
Chromium (mg/kg)	1	--	--	--	--	--	1.6	--	1.5
Zinc (mg/kg)	2	--	--	--	--	--	--	--	--
Lead (mg/kg)	4	7.6	--	5.6	--	4.5	4.2	--	--
Cadmium (mg/kg)	0.5	--	--	0.79	--	--	--	--	--
Copper (mg/kg)	2.5	--	--	--	--	--	--	--	--
TRPHs (mg/kg)	5	13	14	13	8.0	19	19	26	20
Methylene Chloride	1,000	1,000	--	1,100	1,000	--	--	--	--
Total PAHs as Benzo-a-pyrene	1,000	--	--	--	--	--	--	--	--
Phenols as Trichlorophenol	2,000	--	--	--	--	--	--	--	--

Note: These results were reported on a wet-weight basis.

Key:

[a]Duplicate of sample P13S002A.

Qualifiers:
(B) = Compound also present in method blank.
(L) = Present below stated detection limit.

Dash (--) indicates compound not detected.

Source: Ecology and Environment, Inc., 1991.

SUMMARY ANALYTICAL SCREENING RESULTS FOR GROUNDWATER SAMPLES
(FROM TEMPORARY MONITORING WELLS)
NAS PENSACOLA SITE 13
(All results in µg/L, unless noted)

Parameter	Detection Limit	Sample Number (Location)					FPDWS/ FSDWS
		P13GW002 (TW002)	P13GW007 (TW007)	P13GW011 (TW011)	P13GW016 (TW016)	P13GW016D[a] (TW016)	
Chromium	10	30	18	30	57	37	50
Zinc	20	510	30	85	40	24	5,000
Lead	40	53	--	--	--	--	50
Cadmium	5	5.6	--	5.6	--	--	10
Copper	25	170	--	--	--	--	1,000
1,2-Dichlorobenzene	10	--	22	--	--	--	
1,4-Dichlorobenzene	10	--	14	--	--	--	75
1,1-Dichloroethene	10	--	140	--	--	--	7
1,1-Dichloroethane	10	--	110	--	--	--	
Total PAHs as Benzo-a-pyrene	100	--	110	--	--	--	

Key:

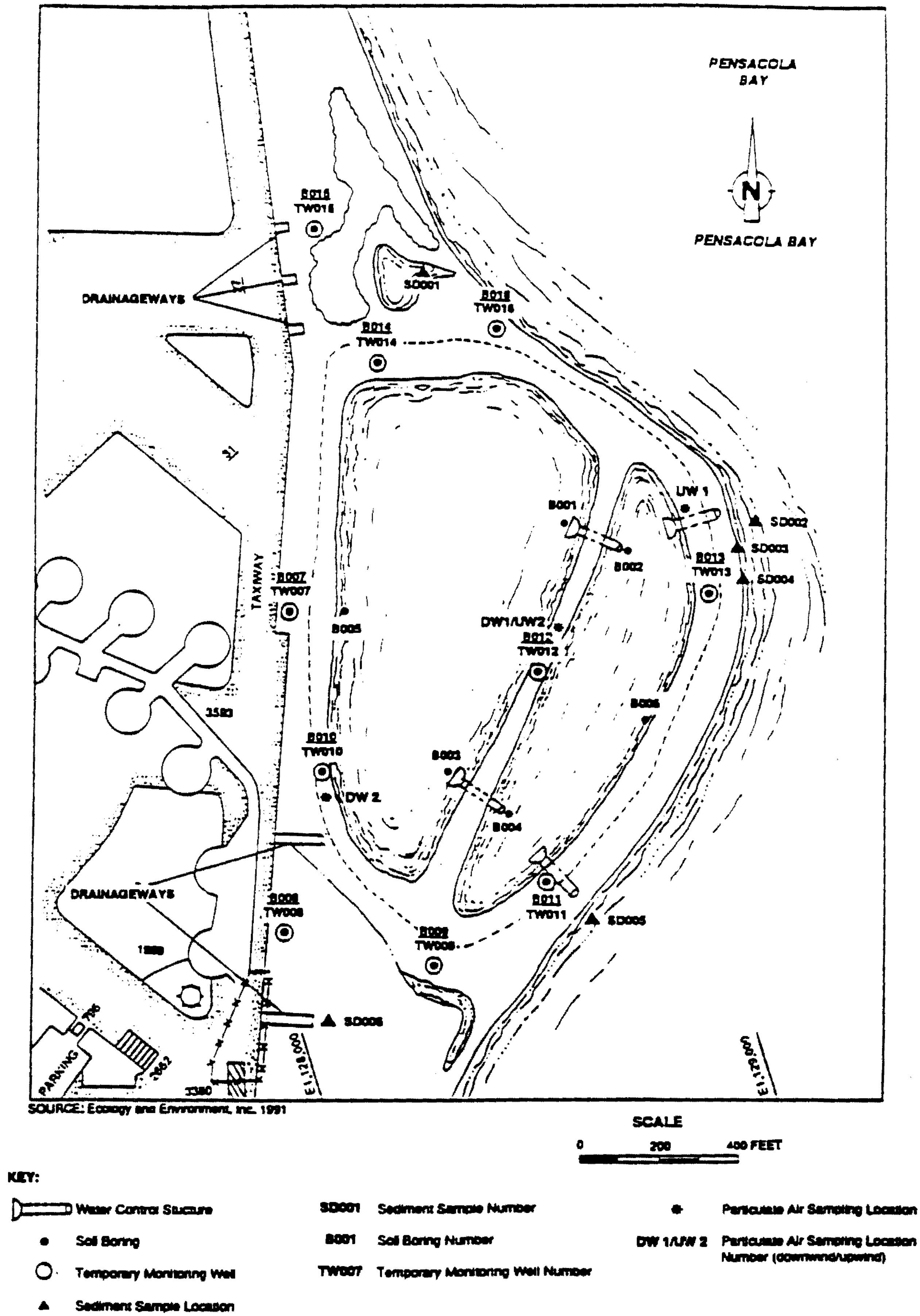
FPDWS = Florida Primary Drinking Water Standard.

FSDWS = Florida Secondary Drinking Water Standard.

[a]Duplicate of sample P13GW016.

Dash (--) indicates compound not detected.

Source: Ecology and Environment, Inc., 1991.



PARTICULATE AIR SAMPLING, SEDIMENT SAMPLE, SOIL BORING, AND TEMPORARY MONITORING WELL LOCATIONS — NAS PENSACOLA SITE 14

SUMMARY ANALYTICAL SCREENING RESULTS FOR SEDIMENT SAMPLES
NAS PENSACOLA SITE 14
(All results in μg/kg, unless noted)

Parameter	(Detection Limit)	Sample Number (Location)					
		P14SD001 (SD001)	P14SD002 (SD002)	P14SD003 (SD003)	P14SD004 (SD004)	P14D005 (SD005)	P14SD006 (SD006)
Chromium (mg/kg)	6.9	1.5	1.4	27	31	1.6	1.5
Zinc (mg/kg)	2	6.5	3.8	37	45	2.7	9.8
Lead (mg/kg)	4	--	--	4.1	6.6	--	--
Nickel (mg/kg)	4	--	--	9.2	13	--	--
Copper (mg/kg)	2.5	--	--	8.3	10	--	--
TRPHs (mg/kg)	5	22	--	5.4	7.4	--	2,500
Methylene Chloride	1,000	8,300(B)	3,400(B)	7,100(B)	6,200(B)	5,600(B)	5,500(B)
Total PAHs as Benzo-a-pyrene	1,000	(L)	1,100	1,700	1,900	(L)	4,700
Phenols as Trichlorophenol	2,000)	2,200	4,300	(L)	3,200	--	--

Note: These results were reported on a wet-weight basis.

Key:

Qualifiers:
(B) = Compound also present in method blank.
(L) = Present below stated detection limit.

Dash (--) indicates compound not detected.

Source: Ecology and Environment, Inc., 1991.

SUMMARY ANALYTICAL SCREENING RESULTS FOR SOIL SAMPLES
NAS PENSACOLA SITE 14
(All results in µg/kg, unless noted)

Parameter	Detection Limit	Sample Number (Location and Depth Interval)						
		P14S001A (B001A)	P14S002A (B002A)	P14S003A (B003A)	P14S004A (B004A)	P14S005A (B005A)	P14S005AD[a] (B005A)	P14S006A (B006A)
Arsenic (mg/kg)	6.9	--	--	--	--	--	--	--
Chromium (mg/kg)	1	9.8	16	17	17	15	11	12
Zinc (mg/kg)	2	18	28	33	31	21	15	15
Lead (mg/kg)	4	--	--	--	--	--	--	--
Cadmium (mg/kg)	0.5	1.5	2.0	2.2	2.1	2.4	1.7	1.3
Copper (mg/kg)	2.5	2.7	4.0	4.0	4.3	3.3	--	2.8
TRPHs (mg/kg)	5	--	25	9.2	6.6	91	81	300
Methylene Chloride	1,000	2,700	2,700	1,900	1,700	1,100	1,200	1,300
Trans-1,2-Dichloroethene	1,000	--	--	--	--	--	--	--
1,1,1-Trichloroethane	1,000	--	--	--	--	--	--	--
Total PAHs as Benzo-a-pyrene	1,000	1,800	1,700	2,800	2,400	(L)	1,500	1,200
Phenols as Trichlorophenol	2,000	13,000	5,000	3,300	16,000	20,000	7,500	4,300

Key at end of table.

(Cont.)

Parameter	Detection Limit	P14S007A (B007A)	P14S008A (B008A)	P14S009A (B009A)	P14S010A (B010A)	P14S010B (B010B)	P14S010C (B010C)
		Sample Number (Location and Depth Interval)					
Arsenic (mg/kg)	6.9	--	7.4	--	--	--	--
Chromium (mg/kg)	1	--	1.8	1.9	--	--	--
Zinc (mg/kg)	2	--	--	--	--	--	--
Lead (mg/kg)	4	--	--	--	--	--	--
Cadmium (mg/kg)	0.5	--	0.78	--	--	--	--
Copper (mg/kg)	2.5	--	--	--	--	--	--
TRPHs (mg/kg)	5	200	1,800	240	24	18	16
Methylene Chloride	1,000	1,300	1,500	1,400	1,600(B)	1,200(B)	1,200(B)
Trans-1,2-Dichloroethene	1,000	--	--	--	--	--	--
1,1,1-Trichloroethane	1,000	--	--	--	--	--	--
Total PAHs as Benzo-a-pyrene	1,000	--	--	--	--	--	1,800
Phenols as Trichlorophenol	2,000	--	--	--	--	--	2,900

Key at end of table.

(Cont.)

Parameter	Detection Limit	Sample Number (Location and Depth Interval)					
		P14S010D (B010D)	P14S010E (B010E)	P14S011A (B011A)	P14S011B (B011B)	P14S011C (B011C)	P14S011D (B011D)
Arsenic (mg/kg)	6.9	--	--	--	--	--	--
Chromium (mg/kg)	1	--	--	--	--	--	--
Zinc (mg/kg)	2	--	--	4.2	--	--	2.2
Lead (mg/kg)	4	--	--	--	--	--	--
Cadmium (mg/kg)	0.5	--	--	--	--	--	--
Copper (mg/kg)	2.5	--	--	--	--	--	--
TRPHs (mg/kg)	5	17	21	--	--	--	--
Methylene Chloride	1,000	1,100(B)	1,200(B)	--	--	--	--
Trans-1,2-Dichloroethene	1,000	--	--	--	--	--	--
1,1,1-Trichloroethane	1,000	--	--	2,500	2,300	1,900	1,800
Total PAHs as Benzo-a-pyrene	1,000	--	--	--	--	--	--
Phenols as Trichlorophenol	2,000	--	--	--	--	--	--

Key at end of table.

(Cont.)

Parameter	Detection Limit	Sample Number (Location and Depth Interval)					
		P14S012A (B012A)	P14S012B (B012B)	P14S012C (B012C)	P14S012D (B012D)	P14S012DD[b] (B012D)	P14S012E (B012E)
Arsenic (mg/kg)	6.9	--	--	--	--	--	--
Chromium (mg/kg)	1	--	--	--	--	--	--
Zinc (mg/kg)	2	--	--	3.1	--	4.4	2.4
Lead (mg/kg)	4	--	--	--	--	10	--
Cadmium (mg/kg)	0.5	--	--	--	--	--	--
Copper (mg/kg)	2.5	--	--	--	--	--	--
TRPHs (mg/kg)	5	--	--	--	--	--	14
Methylene Chloride	1,000	--	--	--	--	--	--
Trans-1,2-Dichloroethene	1,000	--	--	--	--	--	--
1,1,1-Trichloroethane	1,000	1,500	1,800	1,600	3,300	--	--
Total PAHs as Benzo-a-pyrene	1,000	--	--	--	--	--	--
Phenols as Trichlorophenol	2,000	--	--	(L)	--	--	--

Key at end of table.

(Cont.)

Parameter	Detection Limit	P14S013A (B013A)	P14S013B (B013B)	P14S013C (B013C)	P14S013D (B013D)	P14S013E (B013E)	P14S014A (B014A)
		(Sample Number (Location and Depth Interval)					
Arsenic (mg/kg)	6.9	--	--	--	--	--	--
Chromium (mg/kg)	1	--	--	1.1	--	--	1.5
Zinc (mg/kg)	2	2.6	--	3.9	--	3.4	2.3
Lead (mg/kg)	4	--	--	--	--	--	--
Cadmium (mg/kg)	0.5	--	--	--	--	--	--
Copper (mg/kg)	2.5	--	--	--	--	--	--
TRPHs (mg/kg)	5	--	--	--	--	7.6	--
Methylene Chloride	1,000	--	--	--	--	--	--
Trans-1,2-Dichloroethene	1,000	--	--	--	--	--	--
1,1,1-Trichloroethane	1,000	--	--	--	--	--	--
Total PAHs as Benzo-a-pyrene	1,000	--	--	--	--	--	--
Phenols as Trichlorophenol	2,000	--	--	--	--	--	--

Key at end of table.

(Cont.)

Parameter	[Detection Limit	Sample Number (Location and Depth Interval) P14S014B (B014B)	P14S014C (B014C)	P14S014D (B014D)	P14S015A (B015A)	P14S016A (B016A)	P14S016AD[c] (B016A)
Arsenic (mg/kg)	6.9	--	--	--	--	--	--
Chromium (mg/kg)	1	1.6	--	1.0	--	--	1.5
Zinc (mg/kg)	2	3.7	2.9	--	--	2.3	2.8
Lead (mg/kg)	4	--	--	--	--	--	--
Cadmium (mg/kg)	0.5	--	--	--	--	--	--
Copper (mg/kg)	2.5	--	--	--	--	--	--
TRPHs (mg/kg)	5	16	6.5	6.0	--	--	9.3
Methylene Chloride	1,000	--	--	1,600	--	--	--
Trans-1,2-Dichloroethene	1,000	--	--	1,100	2,100	--	2,000
1,1,1-Trichloroethane	1,000	--	--	1,200	--	--	--
Total PAHs as Benzo-a-pyrene	1,000	--	--	--	--	--	--
Phenols as Trichlorophenol	2,000]	--	--	--	--	--	--

Note: These results were reported on a wet-weight basis.

Key:

[a]Duplicate of sample P14S005A.
[b]Duplicate of sample P14S012D.
[c]Duplicate of sample P14S016A.

Dash (--) indicates compound not detected.

Qualifiers:
(B) = Compound also present in method blank.
(L) = Present below stated detection limit.

Source: Ecology and Environment, Inc., 1991.

SUMMARY ANALYTICAL SCREENING RESULTS FOR GROUNDWATER SAMPLES
(FROM TEMPORARY MONITORING WELLS)
NAS PENSACOLA SITE 14
(All results in µg/L, unless noted)

Parameter	Detection Limit	P14GW007 (TW007)	P14GW007D[a] (TW007)	P14GW008 (TW008)	P14GW009 (TW009)	P14GW010 (TW010)	P14GW011 (TW011)	FPDWS/ FSDWS
		Sample Number (Location)						
Chromium	10	11	--	17	16	--	130	50
Zinc	20	200	160	170	36	40	140	5,000
Lead	40	130	130	300	--	120	--	50
Cadmium	5	--	--	--	--	--	13	10
Nickel	40	--	--	--	--	--	49	
Copper	25	58	42	55	--	--	29	1,000
Total PAHs as Benzo-a-pyrene	100	--	--	--	--	--	--	
Phenols as Trichlorophenol	100	--	--	(L)	--	--	--	

Key at end of table.

(Cont.)

Parameter	[Detection Limit	Sample Number (Location) P14GW012 (TW012)	P14GW013 (TW013)	P14GW014 (TW014)	P14GW015 (TW015)	P14GW016 (TW016)	[FPDWS/ FSDWS
Chromium	10	110	46	27	69	35	50
Zinc	20	120	57	64	83	49	5,000
Lead	40	--	--	--	--	--	50
Cadmium	5	11	5.5	--	--	--	10
Nickel	40	56	--	--	--	--	
Copper	25	36	--	--	58	--	1,000]
Total PAHs as Benzo-a-pyrene	100	--	--	--	(L)	--	
Phenols as Trichlorophenol	100]	--	--	--	(L)	--	

Key:

[FPDWS = Florida Primary Drinking Water Standard.
FSDWS = Florida Secondary Drinking Water Standard.]

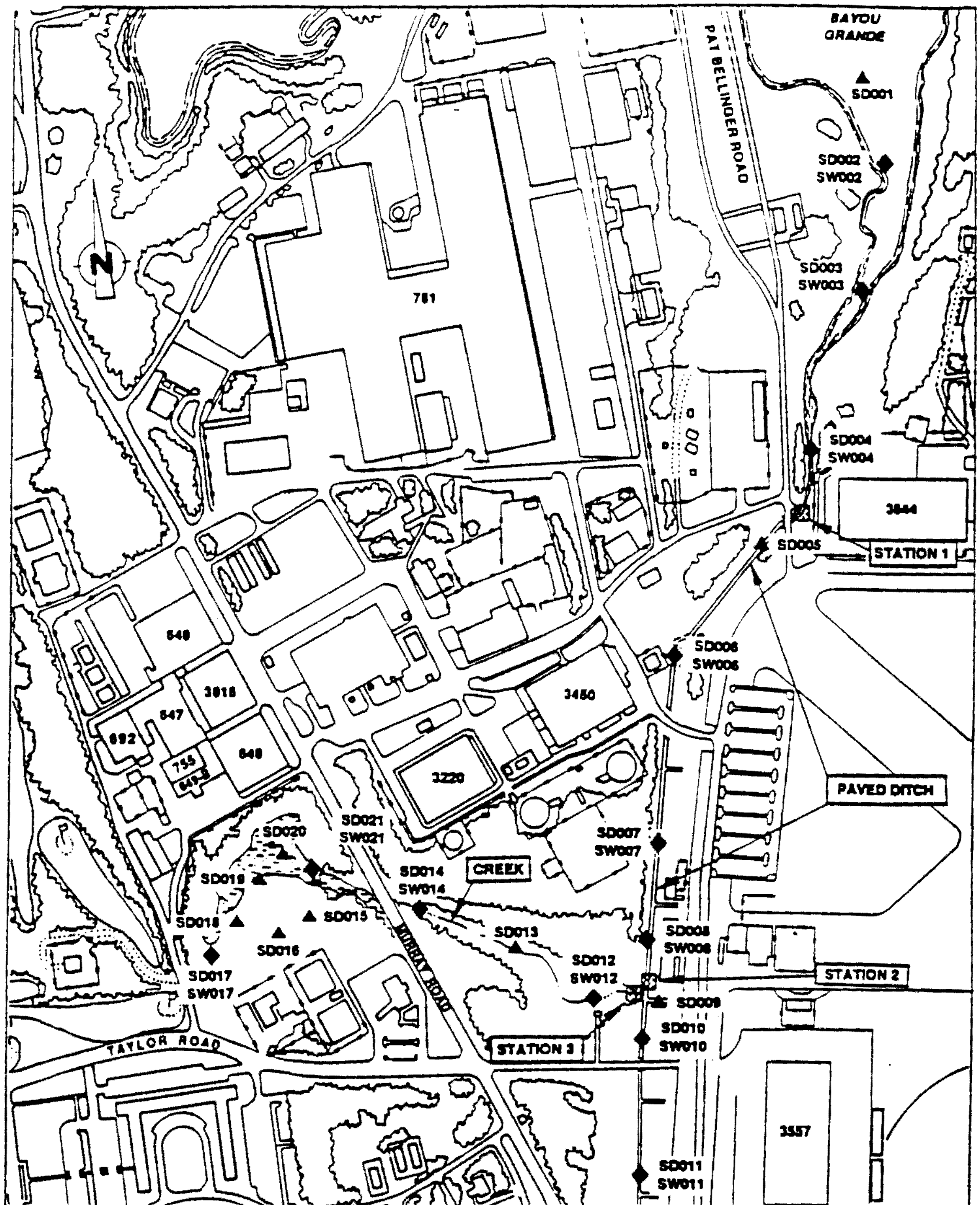
[a]Duplicate of sample P14GW007.

Dash (--) indicates compound not detected.

Qualifier:

(L) = Present below stated detection limit.

Source: Ecology and Environment, Inc., 1991.



SOURCE: Ecology and Environment, Inc., 1991

SCALE
0 200 400 600 FEET

KEY:

▲ Sediment Sample Location

◆ Surface Water and Sediment Sample Location

⊠ Stream Flow Station

SD002 Sediment Sample 002

SW002 Surface Water Sample 002

SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS — NAS PENSACOLA SITE 30

SUMMARY ANALYTICAL SCREENING RESULTS FOR SURFACE WATER SAMPLES
NAS PENSACOLA SITE 30
(All results in µg/L unless noted)

Parameter	Detection Limit	Sample Number (Location)						FSWS
		P30SW002 (SW002)	P30SW003 (SW003)	P30SW004 (SW004)	P30SW006 (SW006)	P30SW007 (SW007)	P30SW008 (SW008)	
Arsenic	69	71	--	120	--	--	--	50
Chromium	10	52	--	--	--	--	--	50
Zinc	20	100	110	110	150	60	150	1000
Copper	25	--	--	--	--	--	--	30
Trichloroethene	10	--	--	--	--	--	--	

Key at end of table.

(Cont.)

Parameter	Detection Limit	Sample Number (Location)							FSWS
		P30SW010 (SW010)	P30SW010D[a] (SW010)	P30SW011 (SW011)	P30SW012 (SW012)	P30SW014 (SW014)	P30SW017 (SW017)	P30SW021 (SW021)	
Arsenic	69	--	--	--	--	--	--	--	50
Chromium	10	--	--	--	--	--	--	--	50
Zinc	20	40	39	65	140	270	110	280	1,000
Copper	25	--	--	--	130	--	--	--	30
Trichloroethene	10	--	--	--	--	16	--	--	

Key:

FSWS Florida Class III Surface Water Standard

[a]Duplicate of sample P30SW010.

Dash (--) indicates compound not detected.

Source: Ecology and Environment, Inc., 1991.

SUMMARY ANALYTICAL SCREENING RESULTS FOR SEDIMENT SAMPLES
NAS PENSACOLA SITE 30
(All results in mg/kg unless noted)

Parameter	Detection Limit	Sample Number (Location)						
		P30SD001 (SD001)	P30SD002 (SD002)	P30SD003 (SD003)	P30SD004 (SD004)	P30SD005 (SD005)	P30SD006 (SD006)	P30SD007 (SD007)
Arsenic	6.9	11	--	--	--	--	--	--
Chromium	1	33	1,800	1,300	15	74	26	53
Zinc	2	12	130	130	74	31	8.4	32
Lead	4	16	400	550	47	35	--	44
Cadmium	0.5	0.82	45	37	1.8	1.3	0.59	1.8
Nickel	4	--	6.3	--	--	--	--	--
Copper	2.5	3.6	47	35	18	5.9	--	7.8
Silver	1	--	2.3	1.5	--	--	--	--
TRPHs	5	--	6,000	32,000	440	180	10	120
Methylene Chloride (µg/kg)	1,000	--	5,200(B)	5,200(B)	5,400(B)	4,500(B)	4,500(B)	2,700(B)
1,1,1-Trichloroethane (µg/kg)	1,000	--	--	--	--	--	--	--
Total PAHs as Benzo-a-pyrene (µg/kg)	1,000	1,200	7,700	33,000	30,000	1,800	(L)	5,600
Phenols as Trichlorophenol (µg/kg)	2,000	--	--	61,000	--	6,600	--	4,400
Dieldrin/4,4-DDE (µg/kg)	1,000	--	--	--	--	--	--	--
Total PCBs (µg/kg)	5,000	--	(L)	(L)	--	--	--	--

Key at end of table.

(Cont.)

Parameter	Detection Limit	P30SD008 (SD008)	P30SD009 (SD009)	P30SD010 (SD010)	P30SD011 (SD011)	P30SD012 (SD012)	P30SD013 (SD013)	P30SD014 (SD014)
		Sample Number (Location)						
Arsenic	6.9	--	--	--	--	--	--	--
Chromium	1	19	10	2.4	1.8	60	120	32
Zinc	2	12	19	30	42	89	85	53
Lead	4	6.7	14	7.6	39	34	180	70
Cadmium	0.5	--	0.78	--	--	2.5	19	2.4
Nickel	4	--	--	--	--	--	5.8	--
Copper	2.5	2.9	5.0	4.1	14	17	36	36
Silver	1	--	--	--	1.6	--	--	--
TRPHs	5	40	45	33	57	290	720	58
Methylene Chloride (μg/kg)	1,000	1,800(B)	23,000(B)	1,700(B)	1,800(B)	20,000(B)	1,700(B)	19,000(B)
1,1,1-Trichloroethane (μg/kg)	1,000	--	--	--	--	--	--	1,000
Total PAHs as Benzo-a-pyrene (μg/kg)	1,000	(L)	1,600	1,200	1,800	(L)	1,100	--
Phenols as Trichlorophenol (μg/kg)	2,000	--	--	2,600	--	--	--	--
Dieldrin/4,4-DDE (μg/kg)	1,000	--	--	--	--	--	--	--
Total PCBs (μg/kg)	5,000	--	--	--	--	--	--	--

Key at end of table.

(Cont.)

Parameter	Detection Limit	P30SD015 (SD015)	P30SD015D[a] (SD015)	P30SD016 (SD016)	P30SD017 (SD017)	P30SD018 (SD018)	P30SD019 (SD019)	P30SD020 (SD020)	P30SD021 (SD021)
		Sample Number (Location)							
Arsenic	6.9	--	--	--	--	--	--	--	--
Chromium	1	17	16	10	1.6	6.3	82	13	18
Zinc	2	86	78	100	34	69	100	240	44
Lead	4	130	120	100	37	87	61	91	32
Cadmium	0.5	1.7	1.3	1.4	--	--	1.7	1.3	1.1
Nickel	4	--	--	--	--	--	13	4.4	--
Copper	2.5	93	84	93	10	68	36	21	10
Silver	1	--	--	--	--	--	--	--	--
TRPHs	5	140	40	170	52	64	100	36	44
Methylene Chloride (μg/kg)	1,000	9,200(B)	5,100(B)	3,500(B)	2,900(B)	2,100(B)	2,500(B)	1,400(B)	1,400(B)
1,1,1-Trichloroethane (μg/kg)	1,000	1,100	--	--	--	--	--	--	--
Total PAHs as Benzo-a-pyrene (μg/kg)	1,000	--	--	--	--	--	--	--	--
Phenols as Trichlorophenol (μg/kg)	5,000	--	--	(L)	--	(L)	--	2,800	--
Dieldrin/4,4-DDE (μg/kg)	1,000	(L)[b]	(L)[b]	(L)[b]	--	(L)[b]	--	--	--
Total PCBs (μg/kg)	5,000	--	--	--	(L)	--	--	--	--

Note: These results were reported on a wet-weight basis.

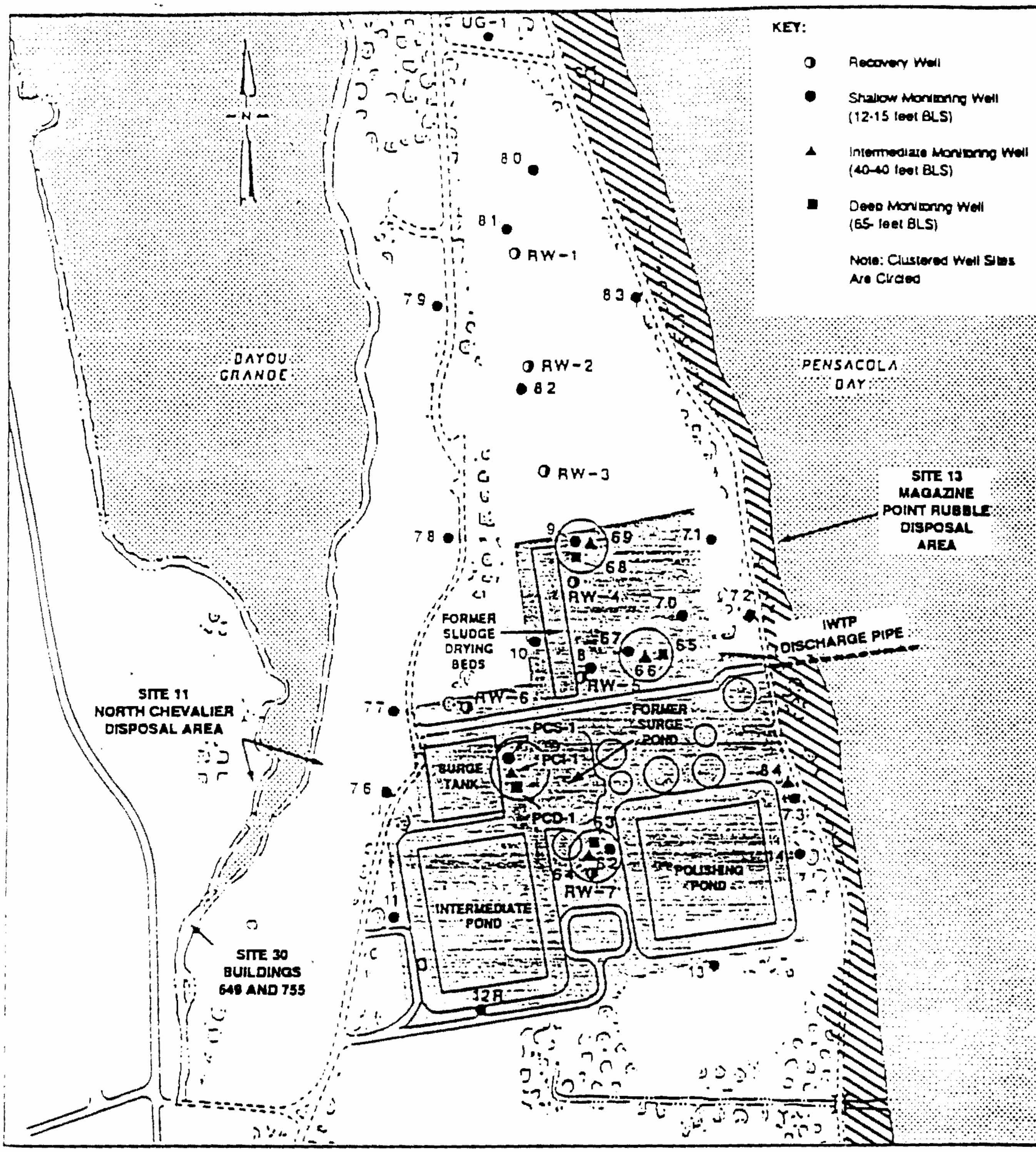
Key:

[a] Duplicate of sample P30SD015
[b] Detection limit for specified parameter increased by a factor of 2 in this sample.

Dash (--) indicates compound not detected.

Qualifiers:
(B) = Compound also present in method blank.
(L) = Present below detection limit.

Source: Ecology and Environment, Inc., 1991.



SOURCE: Geraghty & Miller, Inc., 1988; Ecology and Environment, Inc. 1991

SCALE

0 300 600 FEET

Shaded area Encompasses Sites 32, 33, and 35

IWTP Industrial Wastewater Treatment Plant

SITE MAP — NAS PENSACOLA, SITES 32, 33, AND 35

SUMMARY OF SODIUM CONCENTRATIONS IN GROUNDWATER SAMPLES COLLECTED AT NAS PENSACOLA SITES 32, 33, AND 35
(All results in mg/L)

Monitoring Well	Sampling Date (Month/Year) 8/84	10/84	9/85	1/87	12/87	2/88	6/88	8/88	11/88	3/89
GM-14	NR	NR	NR	NS	NR	NR	NR	NR	NR	200
GM-63	NS	NS	NA	NS	470	420	789	448	NR	515
GM-64	NS	NS	NA	NS	330	200	86	142	NR	55
GM-65	NS	NS	NA	NS	120	110	110	76	NR	100
GM-66	NS	NS	NA	NS	640	670	527	465	NR	662
GM-68	NS	NS	NA	88	61	67	72	79	NR	57
GM-69	NS	NS	NA	NS	510	500	561	598	NR	669
GM-71	NS	NS	NA	18	9.8	5.7	4	7	NR	3,201
GM-72	NS	NS	NA	NS	79	42	44	73	NR	2,793
GM-76	NS	NS	NA	NS	210	190	207	501	NR	22
GM-77	NS	NS	NA	NS	53	43	40	303	NR	117
GM-84	NS	NS	NR	NS	NA	NA	NA	NA	NR	4,450
PCS-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
PCI-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
PCD-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Key at end of table.

(Cont.)

Monitoring Well	Sampling Date (Month/Year)								
	5/89	8/89	11/89	3/90	5/90	8/90	11/90	3/91	7/91
GM-14	184	180	164	140	120	NS	130	56	25
GM-63	604	449	479	560	510	550	560	480	500
GM-64	3.8	105	241	320	210	310	290	320	320
GM-65	1.78	1,070	88.9	120	180	180	92	93	96
GM-66	6.83	160	842	820	670	580	730	670	680
GM-68	69	600	693	77	81	90	84	81	89
GM-69	879	618	693	690	600	620	670	580	610
GM-71	258	NS	110	6.7	12	NS	150	6.2	3.2
GM-72	288	NS	27.4	17	13	NS	60	83	19
GM-76	39.1	NS	136	100	64	NS	110	110	110
GM-77	1.48	NS	46.5	44	28	NS	1,100	200	150
GM-84	10,200	4,470	5,540	4,300	4,400	NS	4,700	14,000	NS
PCS-1	NS	NS	NS	NS	19	7.4	5.2	220	6.7
PCI-1	NS.	NS	NS	NS	120	310	370	360	270
PCD-1	NS	NS	NS	NS	130	160	190	180	180

Note: Bold numbers indicate value exceeds FPDWS of 160 mg/L.

Key:

NS = Monitoring well did not exist, or existed and was not sampled.
NA = Monitoring well sampled but sample not analyzed for this parameter.
NR = No data reported.

Source: Ecology and Environment, Inc., 1991.

SUMMARY OF CADMIUM CONCENTRATIONS IN GROUNDWATER
SAMPLES COLLECTED AT NAS PENSACOLA SITES 32, 33, AND 35
(All results in μg/L)

Monitoring Well	Sampling Date (Month/Year)										
	7/84	10/84	9/85	1/87	2/87	5/87	8/87	12/87	2/88	6/88	8/88
GM-66	NS	NS	NA	NS	NA	NA	NA	NA	NA	NA	NA

Monitoring Well	Sampling Date (Month/Year)										
	11/88	3/89	5/89	8/89	11/89	3/90	5/90	8/90	11/90	3/91	7/91
GM-66	NR	--	NA	NA	NA	**43**	NA	**31**	NA	**57**	NA

Note: Bold numbers indicate value exceeds FPDWS of 10 μg/L.

Key:

NS = Monitoring well did not exist, or existed and was not sampled.
NA = Monitoring well sampled but sample not analyzed for this parameter.
NR = No data reported.
-- = Parameter not detected.

Source: Ecology and Environment, Inc., 1991.

SUMMARY OF CHROMIUM CONCENTRATIONS IN GROUNDWATER
SAMPLES COLLECTED AT NAS PENSACOLA SITES 32, 33, AND 35
(All results in µg/L)

Monitoring Well	Sampling Date (Month/Year)										
	7/84	10/84	9/85	1/87	2/87	5/87	8/87	12/87	2/88	6/88	8/88
GM-66	NS	NS	NA	NS	NA	NA	NA	NA	NA	NA	NA

Monitoring Well	Sampling Date (Month/Year)										
	11/88	3/89	5/89	8/89	11/89	1/90	5/90	8/90	11/90	1/91	7/91
GM-66	NR	NA	NA	NA	NA	**210**	NA	**240**	NA	**360**	NA

Note: Bold numbers indicate value exceeds FPDWS of 50 µg/L.

Key:

NS = Monitoring well did not exist, or existed and was not sampled.
NA = Monitoring well sampled but sample not analyzed for this parameter.
NR = No data reported.

Source: Ecology and Environment, Inc., 1991.

SUMMARY OF LEAD CONCENTRATIONS IN GROUNDWATER
SAMPLES COLLECTED AT NAS PENSACOLA SITES 32, 33, AND 35
(All results in μg/L)

Monitoring Well	Sampling Date (Month/Year)										
	7/84	10/84	9/85	1/87	2/87	5/87	8/87	12/87	2/88	6/88	8/88
GM-66	NS	NS	NA	NS	NA	NA	NA	NA	NA	NA	NA

Monitoring Well	Sampling Date (Month/Year)										
	11/88	3/89	5/89	8/89	11/89	3/90	5/90	8/90	11/90	3/91	7/91
GM-66	NR	NA	NA	NA	NA	2.6	NA	NA	NA	**400**	NA

Note: Bold numbers indicate value exceeds FPDWS of 50 μg/L.

Key:

NS = Monitoring well did not exist, or existed and was not sampled.
NA = Monitoring well sampled but sample not analyzed for this parameter.
NR = No data reported.

Source: Ecology and Environment, Inc., 1991.

SUMMARY OF ARSENIC CONCENTRATIONS IN GROUNDWATER SAMPLES COLLECTED AT NAS PENSACOLA SITES 32, 33, AND 35
(All results in µg/L)

Monitoring Well	Sampling Date (Month/Year)									
	7/84	10/84	9/85	1/87	12/87	2/88	6/88	8/88	11/88	3/89
UG-1	NA	NA	NS	--	NS	NA	NA	NA	NA	--

Monitoring Well	Sampling Date (Month/Year)								
	5/89	8/89	11/89	3/90	5/90	8/90	11/90	3/91	7/91
UG-1	--	--	--	--	51	--	2.6	--	--

Note: Bold numbers indicate value exceeds FPDWS of 50 µg/L.

Key:

NS = Monitoring well did not exist, or existed and was not sampled.
NA = Monitoring well sampled but sample not analyzed for this parameter.
-- = Parameter not detected.

Source: Ecology and Environment, Inc., 1991.

SUMMARY OF MERCURY CONCENTRATIONS IN GROUNDWATER SAMPLES COLLECTED AT NAS PENSACOLA SITES 32, 33, AND 35
(All results in µg/L)

Monitoring Well	Sampling Date (Month/Year)									
	7/84	10/84	9/85	1/87	12/87	2/88	6/88	8/88	11/88	3/89
GM-11	NS	NS	NS	NS	NS	NS	NS	NS	NS	--

Monitoring Well	Sampling Date (Month/Year)								
	5/89	8/89	11/89	3/90	5/90	8/90	11/90	3/91	7/91
GM-11	--	0.22	**4.4**	--	--	NS	--	--	--

Note: Bold numbers indicate value exceeds FPDWS of 2 µg/L.

Key:

NS = Monitoring well did not exist, or existed and was not sampled.
-- = Parameter not detected.

Source: Ecology and Environment, Inc., 1991.

SUMMARY OF VINYL CHLORIDE CONCENTRATIONS IN GROUNDWATER SAMPLES COLLECTED AT NAS PENSACOLA SITES 32, 33, AND 35
(All results in ug/L)

Monitoring Well	Sampling Date (Month/Year)													
	2/84	7/84	10/84	9/85	4/86	1/87	2/87	5/87	8/87	12/87	2/88	4/88	6/88	8/88
DG-1	NR	10	32	NS	NR	NS	NR	NR	NR	NS	--	NS	NS	NS
DG-2	NR	NS	NS	1	NR	NS	NR	NR	NR	2(J)	--	NS	NS	NS
DG-4	NR	20	16	NS	--	--	NR	NR	--	2(J)	250(E)	--	NS	--
DG-5	NR	--	9	NS	NR	NS	NR	NR	NR	NS	7(J)	NR	--	--
DG-6	--	--	13	NS	NR	--	NR	NR	NR	NS	--	NS	NS	NS
GM-8	NR	NR	NR	NA	NR	NS	NR	NR	NR	NS	NS	NR	NR	NR
GM-9	NR	NS	21	NA	NR	NS	NR	NR	NR	--	--	NR	NR	NR
GM-10	NR	NS	7	NA	NR	NS	NR	NR	NR	NS	NS	NR	NR	NR
GM-64	NS	NS	NS	--	NR	NS	NR	NR	NR	2(J)	--	NR	NR	NR
GM-66	NS	NS	NS	27	NR	NS	146	--	--	270	170	NR	NR	NR
GM-69	NS	NS	NS	3	NR	NS	17	--	--	22	13	NR	NR	NR
GM-75	NS	NS	NS	1	NR	NS	NR	NR	NR	3(J)	2(J)	NS	NS	NS

Key at end of table.

SUMMARY OF 1,1-DICHLOROETHENE CONCENTRATIONS IN GROUNDWATER SAMPLES COLLECTED AT NAS PENSACOLA SITES 32, 33, AND 35
(All results in μg/L)

Monitoring Well	Sampling Date (Month/Year)												
	2/84	5/84	7/84	10/84	9/85	1/87	2/87	5/87	8/87	12/87	2/88	6/88	8/88
DG-1	NS	NS	--	800	NS	NS	NR	NR	NR	NS	--	NA	NA
DG-6	8	<10	--	25	NS	--	NR	NR	NR	NS	--	NS	NS
GM-8	NS	NS	--	--	NA	NS	NR	NR	NR	NR	NR	NR	NR
GM-9	NS	NS	125	(L)	NA	NS	11	NR	NR	--	--	NR	NR
GM-64	NS	NS	NS	NS	--	NS	NR	NR	NR	--	--	9	NR
GM-66	NS	NS	NS	NS	160	NS	446	NR	NR	390	320(E)	500	NR
GM-67	NS	NS	NS	NS	--	NS	--	NR	NR	--	--	NR	NR
GM-69	NS	NS	NS	NS	--	NS	NR	NR	NR	2(J)	--	NR	NR

Key at end of table.

(Cont.)

Monitoring Well	Sampling Date (Month/Year)										
	11/88	3/89	5/89	8/89	11/89	3/90	5/90	8/90	11/90	3/91	7/91
DG-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DG-6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
GM-8	NR	**125**	**35**	--	--	--	--	--	--	--	--
GM-9	NR	--	--	--	--	--	--	--	--	--	--
GM-64	NR	--	--	--	--	--	--	--	--	--	--
GM-66	NR	**310**	**1,100**	**320(J)**	**320**	**350(E)**	(L)	**260**	(L)	(L)	--
GM-67	NR	--	--	--	--	--	--	--	--	--	--
GM-69	NR	--	--	--	--	--	--	**98**	--	--	--

Note: Bold numbers indicate value exceeds FPDWS of 7 μg/L.

Key:

NS = Monitoring well did not exist, or existed and was not sampled.
NA = Monitoring well sampled but sample not analyzed for this parameter.
NR = No data reported.
-- = Parameter not detected.
(L) = Present below the detection limit.
(J) = Estimated value; compound present below the detection limit.
(E) = Concentration exceeded calibrated range of instrument.

Source: Ecology and Environment, Inc., 1991.

SUMMARY OF 1,2-DICHLOROETHANE CONCENTRATIONS IN GROUNDWATER SAMPLES COLLECTED AT NAS PENSACOLA SITES 32, 33, AND 35
(All results in $\mu g/L$)

Monitoring Well	Sampling Date (Month/Year)										
	7/84	10/84	9/85	1/87	2/87	5/87	8/87	12/87	2/88	6/88	8/88
GM-9	**9,600**	<1	NA	NS	--	--	--	--	--	--	--
GM-64	NS	NS	--	NS	NR	NR	NR	--	--	**4**	--

Monitoring Well	Sampling Date (Month/Year)										
	11/88	3/89	5/89	8/89	11/89	3/90	5/90	8/90	11/90	3/91	7/91
GM-9	NR	--	--	--	--	--	--	--	--	--	--
GM-64	NR	--	--	--	--	--	--	--	--	--	--

Note: Bold numbers indicate value exceeds FPDWS of 3 $\mu g/L$.

Key:

NS = Monitoring well did not exist, or existed and was not sampled.
NA = Monitoring well sampled but sample not analyzed for this parameter.
NR = No data reported.
-- = Parameter not detected.

Source: Ecology and Environment, Inc., 1991.

SUMMARY OF CHLOROFORM CONCENTRATIONS IN GROUNDWATER
SAMPLES COLLECTED AT NAS PENSACOLA SITES 32, 33, AND 35
(All results in μg/L)

Monitoring Well	Sampling Date (Month/Year)								
	7/84	10/84	9/85	1/87	12/87	2/88	6/88	8/88	11/88
DG-1	NR	320	NS	NS	NS	--	NS	NS	NS

Monitoring Well	Sampling Date (Month/Year)									
	3/89	5/89	8/89	11/89	3/90	5/90	8/90	11/90	3/91	7/91
DG-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Note: Bold numbers indicate value exceeds FPDWS of 100 ug/L.

Key:

NS = Monitoring well did not exist, or existed and was not sampled.
NR = No data reported.
-- = Parameter not detected.

Source: Ecology and Environment, Inc., 1991.

SUMMARY OF CARBON TETRACHLORIDE CONCENTRATIONS IN GROUNDWATER
SAMPLES COLLECTED AT NAS PENSACOLA SITES 32, 33, AND 35
(All results in µg/L)

Monitoring Well	Sampling Date (Month/Year)									
	2/84	7/84	10/84	9/85	1/87	12/87	2/88	6/88	8/88	11/88
DG-1	NA	NR	**425**	NS	NS	NS	--	NS	NS	NS
DG-6	NR	NR	**9**	NS	--	NS	--	NS	NS	NS

Monitoring Well	Sampling Date (Month/Year)									
	3/89	5/89	8/89	11/89	3/90	5/90	8/90	11/90	3/91	7/91
DG-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DG-6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Note: Bold numbers indicate value exceeds FPDWS of 3 µg/L.

Key:

NS = Monitoring well did not exist, or existed and was not sampled.
NA = Monitoring well sampled but sample not analyzed for this parameter.
NR = No data reported.
-- = Parameter not detected.

Source: Ecology and Environment, Inc., 1991.

SUMMARY OF TRICHLOROETHENE CONCENTRATIONS IN GROUNDWATER SAMPLES COLLECTED AT NAS PENSACOLA SITES 32, 33, AND 35
(All results in μg/L)

Monitoring Well	Sampling Date (Month/Year)											
	2/84	5/84	7/84	10/84	9/85	1/87	2/87	5/87	8/87	12/87	2/88	6/88
UG-1	NR	NR	--	NR	NS	--	NR	NR	NR	NS	--	--
DG-1	NR	NR	--	20	NS	NS	NR	NR	NR	NS	--	NS
DG-2	NR	NR	NS	NS	6	NS	NR	NR	NR	--	--	NS
DG-4	NR	NR	--	13	NS	--	NR	NR	NR	--	1(J)	NS
DG-6	58	21	20	32	NS	--	NR	NR	NR	NR	--	NS
GM-8	NR	NR	--	--	NA	NS	NR	NR	NR	NS	NS	NR
GM-9	NR	NR	60	(L)	NA	NS	7	1	NR	--	--	--
GM-12R	NR	NR	NR	NR	NA	--	NR	NR	NR	NS	NR	NR
GM-65	NS	NS	NS	NS	4	NS	NR	NR	NR	50	--	--
GM-66	NS	NS	NS	NS	2,600	NS	15,907	24,750	13,600	10,000	4,200(E)	6,300
GM-67	NS	NS	NS	NS	50	NS	78	8	NR	--	--	--
GM-68	NS	NS	NS	NS	10	--	NR	NR	NR	--	--	--
GM-69	NS	NS	NS	NS	3	NS	8	6	NR	--	--	--
GM-70	NS	NS	NS	NS	7	NS	NS	NS	NS	NS	NS	NS

Key at end of table.

(Cont.)

Monitoring Well	Sampling Date (Month/Year)											
	8/88	11/88	3/89	5/89	8/89	11/89	3/90	5/90	8/90	11/90	3/91	7/91
UG-1	--	--	ND	ND	ND	6(B)	ND	ND	ND	ND	ND	ND
DG-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DG-2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DG-4	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
GM-8	NS	NS	56	1(J)	--	1(J)	--	--	--	--	--	--
GM-9	--	NS	--	--	--	4(J,B)	--	--	--	--	--	--
GM-12R	NR	NS	NR	--	--	6(B)	--	--	NA	--	--	--
GM-65	--	NS	--	--	--	--	--	--	--	--	--	--
GM-66	5,000	NA	8,900	6,500	11,000	8,400(E)	--	--	7,300(E)	140	8,200	12,000
GM-67	--	NS	--	--	--	2(J,B)	--	--	--	--	--	--
GM-68	--	NS	--	--	--	4(J,B)	--	--	--	--	--	--
GM-69	--	NS	--	--	--	1(J)	--	--	--	--	--	--
GM-70	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Note: Bold numbers indicate value exceeds FPDWS of 3 µg/L.

Key:

NS = Monitoring well did not exist, or existed and was not sampled.
NA = Monitoring well sampled but sample not analyzed for this parameter.
NR = No data reported.
-- = Parameter not detected.
(L) = Present below the detection limit.
(J) = Estimated value; compound present below the detection limit.
(B) = Compound also present in method blank.
(E) = Exceeds calibration limit.

Source: Ecology and Environment, Inc., 1991.

SUMMARY OF 1,1,1-TRICHLOROETHANE CONCENTRATIONS IN GROUNDWATER SAMPLES COLLECTED AT NAS PENSACOLA SITES 32, 33, AND 35
(All results in mg/L)

Monitoring Well	Sampling Date (Month/Year)										
	7/84	10/84	9/85	1/87	2/87	5/87	8/87	12/87	2/88	6/88	8/88
DG-1	110	5,900	NS	NS	NR	NR	NR	NS	--	NS	NS
DG-6	330	103	NS	--	NR	NR	NR	NS	--	NS	NS
GM-8	--	--	NA	NS	NR	NR	NR	NS	NS	NR	NR
GM-9	11,500	(L)	NA	NS	356	NR	NR	--	--	--	--

Monitoring Well	Sampling Date (Month/Year)										
	11/88	3/89	5/89	8/89	11/89	3/90	5/90	8/90	11/90	3/91	7/91
DG-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DG-6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
GM-8	NR	1,200	6	--	--	--	--	--	--	--	--
GM-9	NR	--	--	--	--	--	--	--	--	--	--

Note: Bold numbers indicate value exceeds FPDWS of 200 ug/L.

Key:

NS = Monitoring well did not exist, or existed and was not sampled.
NA = Monitoring well sampled but sample not analyzed for this parameter.
NR = No data reported.
-- = Parameter not detected.
(L) = Present below the detection limit.

Source: Ecology and Environment, Inc., 1991.

SUMMARY OF TETRACHLOROETHENE CONCENTRATIONS IN GROUNDWATER
SAMPLES COLLECTED AT NAS PENSACOLA SITES 32, 33, AND 35
(All results in ug/L)

Monitoring Well	Sampling Date (Month/Year)												
	2/84	5/84	7/84	10/84	9/85	1/87	2/87	5/87	8/87	12/87	2/88	6/88	8/88
DG-1	NS	NS	—	500	NS	NS	NR	NR	NR	NS	—	NS	NS
DG-2	NS	NS	NS	NS	17	NS	NR	NR	NR	—	—	NS	NS
DG-3	NS	NS	NS	NS	10	NS	NS	NS	NS	NS	NS	NS	NS
DG-4	NS	NS	—	11	NS	—	NR	NR	NR	—	—	—	—
DG-6	6	<10	—	38	NS	—	NR	NR	NR	NS	—	NS	NS
GM-8	NS	NS	—	NR	NA	NS	NR	NR	NR	NS	NS	NR	NR
GM-9	NS	NS.	675	4	NA	NS	42	23	NR	—	—	—	—
GM-62	NS	NS	NS	NS	6	NS	NR	NR	NR	—	—	—	—
GM-63	NS	NS	NS	NS	6	NS	NR	NR	NR	—	—	—	—
GM-64	NS	NS	NS	NS	9	NS	NR	NR	NR	—	—	—	—
GM-66	NS	NS	NS	NS	5	NS	8	—	—	4(J)	4(J)	—	—
GM-69	NS	NS	NS	NS	—	NS	NR	NR	NR	—	—	—	—
GM-81	NS	NS	NS	NS	78	NS	NS	NS	NS	NS	NS	NS	NS
GM-82	NS	NS	NS	NS	19	NS	NS	NS	NS	NS	NS	NS	NS
GM-83	NS	NS	NS	NS	25	NS	NR	NR	NR	NA	NA	NA	NA

Key at end of table.

(Cont.)

Monitoring Well	Sampling Date (Month/Year)										
	11/88	3/89	5/89	8/89	11/89	3/90	5/90	8/90	11/90	3/91	7/91
DG-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DG-2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DG-4	NR	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DG-6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
GM-8	NR	138	22	9	1(J)	—	—	—	—	(L)	—
GM-9	NR	—	—	—	—	—	—	—	—	—	—
GM-62	NR	—	—	—	—	—	—	—	—	—	—
GM-63	NR	—	—	—	—	—	—	—	—	—	—
GM-64	NR	—	—	—	—	—	—	—	—	—	—
GM-66	NR	—	—	—	—	4(J)	—	—	—	—	—
GM-69	NR	4	6	7	7	(L)	(L)	—	—	—	—
GM-81	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
GM-82	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
GM-83	NR	NS	NA	NS	NA	NA	NA	NS	NA	NA	NA

Note: Bold numbers indicate value exceeds FPDWS of 3 ug/L.

Key:

NS = Monitoring well did not exist, or existed and was not sampled.
NA = Monitoring well sampled but sample not analyzed for this parameter.
NR = No data reported.
— = Parameter not detected.
(L) = Present below the detection limit
(J) = Estimated value; compound present below the detection limit.

Source: Ecology and Environment, Inc., 1991.

SUMMARY OF BENZENE CONCENTRATIONS IN GROUNDWATER
SAMPLES COLLECTED AT NAS PENSACOLA SITES 32, 33, AND 35
(All results in µg/L)

Monitoring Well	Sampling Date (Month/Year)											
	2/84	5/84	7/84	10/84	9/85	1/87	2/87	5/87	8/87	12/87	2/88	6/88
DG-4	NS	NS	NS	2	NS	--	NR	NR	NR	3(J)	0.4(J)	NS
DG-5	NS	NS	NS	2	NS	NS	NR	NR	NR	NS	--	NR
DG-6	3.5	<10	ND	2	NS	--	NR	NR	NR	NS	--	NS
GM-8	--	--	--	--	NA	NS	--	--	--	--	--	--
GM-66	NS	NS	NS	NS	--	NS	--	--	--	--	--	--
GM-67	NS	NS	NS	NS	NR	NS	NR	NR	2	--	--	--
GM-69	NS	NS	NS	NS	3	NS	9	3	NR	6	5	--

Monitoring Well	Sampling Date (Month/Year)											
	8/88	11/88	3/89	5/89	8/89	11/89	3/90	5/90	8/90	11/90	3/91	7/91
DG-4	NR	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DG-5	NR	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS	NS
DG-6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
GM-8	--	--	--	--	--	--	(L)	--	(L)	--	--	750
GM-66	--	NR	--	--	--	--	2(J)	--	--	--	--	--
GM-67	--	NA	--	--	--	--	--	--	--	--	--	--
GM-69	--	NA	3	--	3(J)	--	--	--	(L)	--	--	--

Note: Bold numbers indicate value exceeds FPDWS of 1 µg/L.

Key:

NS = Monitoring well did not exist, or existed and was not sampled.
NA = Monitoring well sampled but sample not analyzed for this parameter.
NR = No data reported.
-- = Parameter not detected.
(L) = Present below the detection limit.
(J) = Estimated value; compound present below the detection limit.

Sour Ecology and Environment, Inc., 1991.

(Cont.)

Monitoring Well	Sampling Date (Month/Year)										
	11/88	3/89	5/89	8/89	11/89	3/90	5/90	8/90	11/90	3/91	7/91
DG-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DG-2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DG-4	NR	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DG-6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
GM-8	NR	**138**	**22**	**9**	1(J)	—	—	—	—	(L)	—
GM-9	NR	—	—	—	—	—	—	—	—	—	—
GM-62	NR	—	—	—	—	—	—	—	—	—	—
GM-63	NR	—	—	—	—	—	—	—	—	—	—
GM-64	NR	—	—	—	—	—	—	—	—	—	—
GM-66	NR	—	—	—	—	4(J)	—	—	—	—	—
GM-69	NR	**4**	**6**	**7**	**7**	(L)	(L)	—	—	—	—
GM-81	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
GM-82	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
GM-83	NR	NS	NA	NS	NA	NA	NA	NS	NA	NA	NA

Note: Bold numbers indicate value exceeds FPDWS of 3 ug/L.

Key:

NS = Monitoring well did not exist, or existed and was not sampled.
NA = Monitoring well sampled but sample not analyzed for this parameter.
NR = No data reported.
— = Parameter not detected.
(L) = Present below the detection limit
(J) = Estimated value; compound present below the detection limit.

Source: Ecology and Environment, Inc., 1991.

SUMMARY OF BENZENE CONCENTRATIONS IN GROUNDWATER
SAMPLES COLLECTED AT NAS PENSACOLA SITES 32, 33, AND 35
(All results in μg/L)

Monitoring Well	Sampling Date (Month/Year)											
	2/84	5/84	7/84	10/84	9/85	1/87	2/87	5/87	8/87	12/87	2/88	6/88
DG-4	NS	NS	NS	**2**	NS	--	NR	NR	NR	**3(J)**	0.4(J)	NS
DG-5	NS	NS	NS	**2**	NS	NS	NR	NR	NR	NS	--	NR
DG-6	**3.5**	<10	ND	**2**	NS	--	NR	NR	NR	NS	--	NS
GM-8	--	--	--	--	NA	NS	--	--	--	--	--	--
GM-66	NS	NS	NS	NS	--	NS	--	--	--	--	--	--
GM-67	NS	NS	NS	NS	NR	NS	NR	NR	**2**	--	--	--
GM-69	NS	NS	NS	NS	**3**	NS	**9**	**3**	NR	**6**	**5**	--

Monitoring Well	Sampling Date (Month/Year)											
	8/88	11/88	3/89	5/89	8/89	11/89	3/90	5/90	8/90	11/90	3/91	7/91
DG-4	NR	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DG-5	NR	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS	NS
DG-6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
GM-8	--	--	--	--	--	--	(L)	--	(L)	--	--	750
GM-66	--	NR	--	--	--	--	**2(J)**	--	--	--	--	--
GM-67	--	NA	--	--	--	--	--	--	--	--	--	--
GM-69	--	NA	**3**	--	**3(J)**	--	--	--	(L)	--	--	--

Note: Bold numbers indicate value exceeds FPDWS of 1 μg/L.

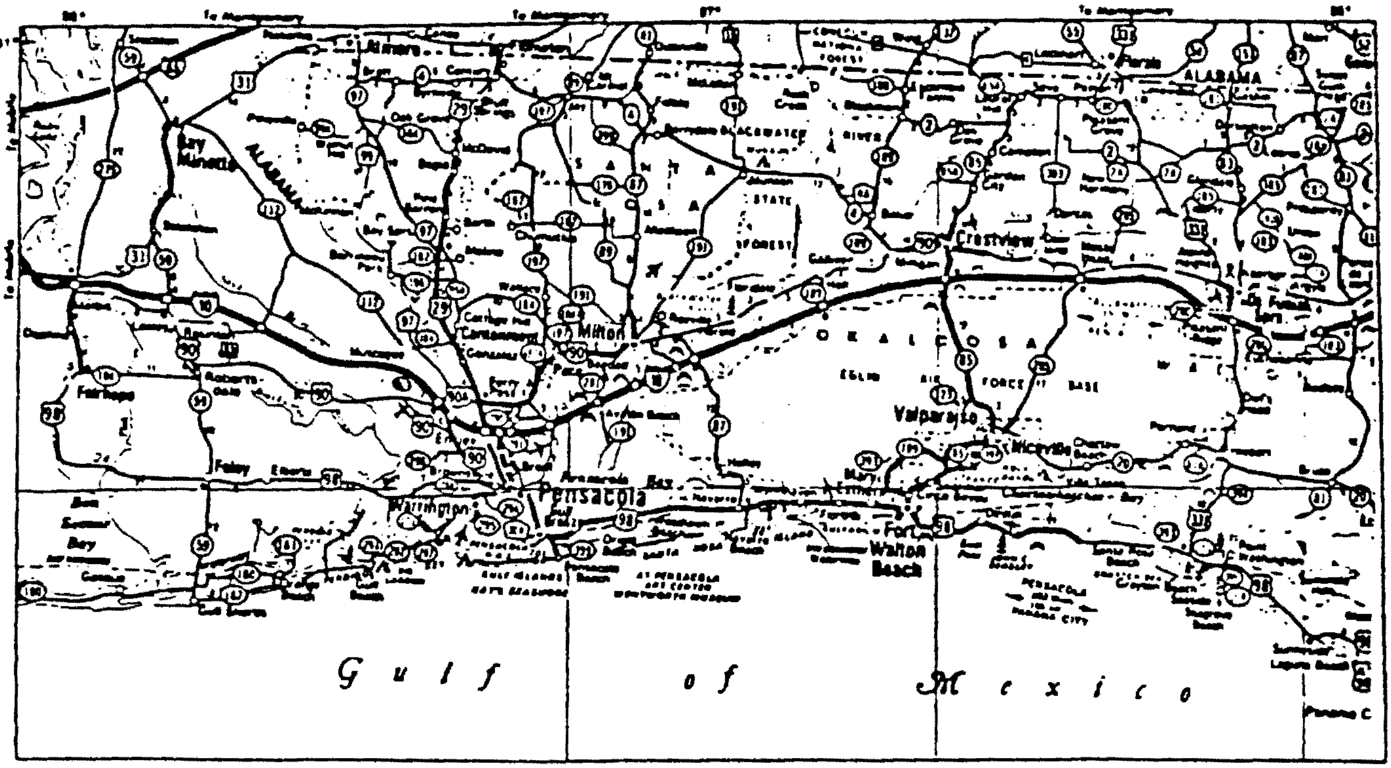
Key:

NS = Monitoring well did not exist, or existed and was not sampled.
NA = Monitoring well sampled but sample not analyzed for this parameter.
NR = No data reported.
-- = Parameter not detected.
(L) = Present below the detection limit.
(J) = Estimated value; compound present below the detection limit.

Sour... Ecology and Environment, Inc., 1991.

Figures and Data Tables

USEPA Field Investigation, Naval Air Station Pensacola (NASP), Pensacola, Florida



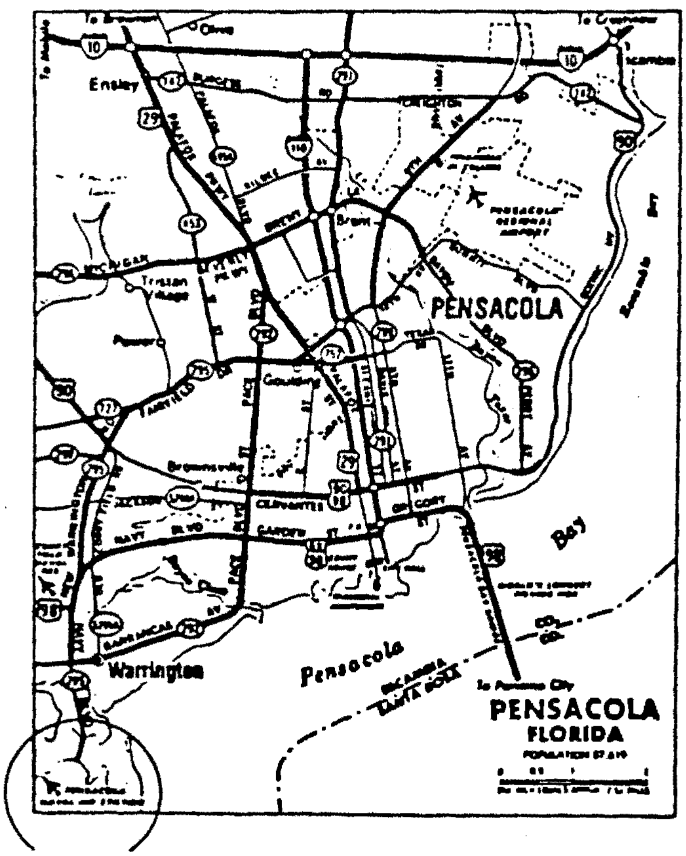
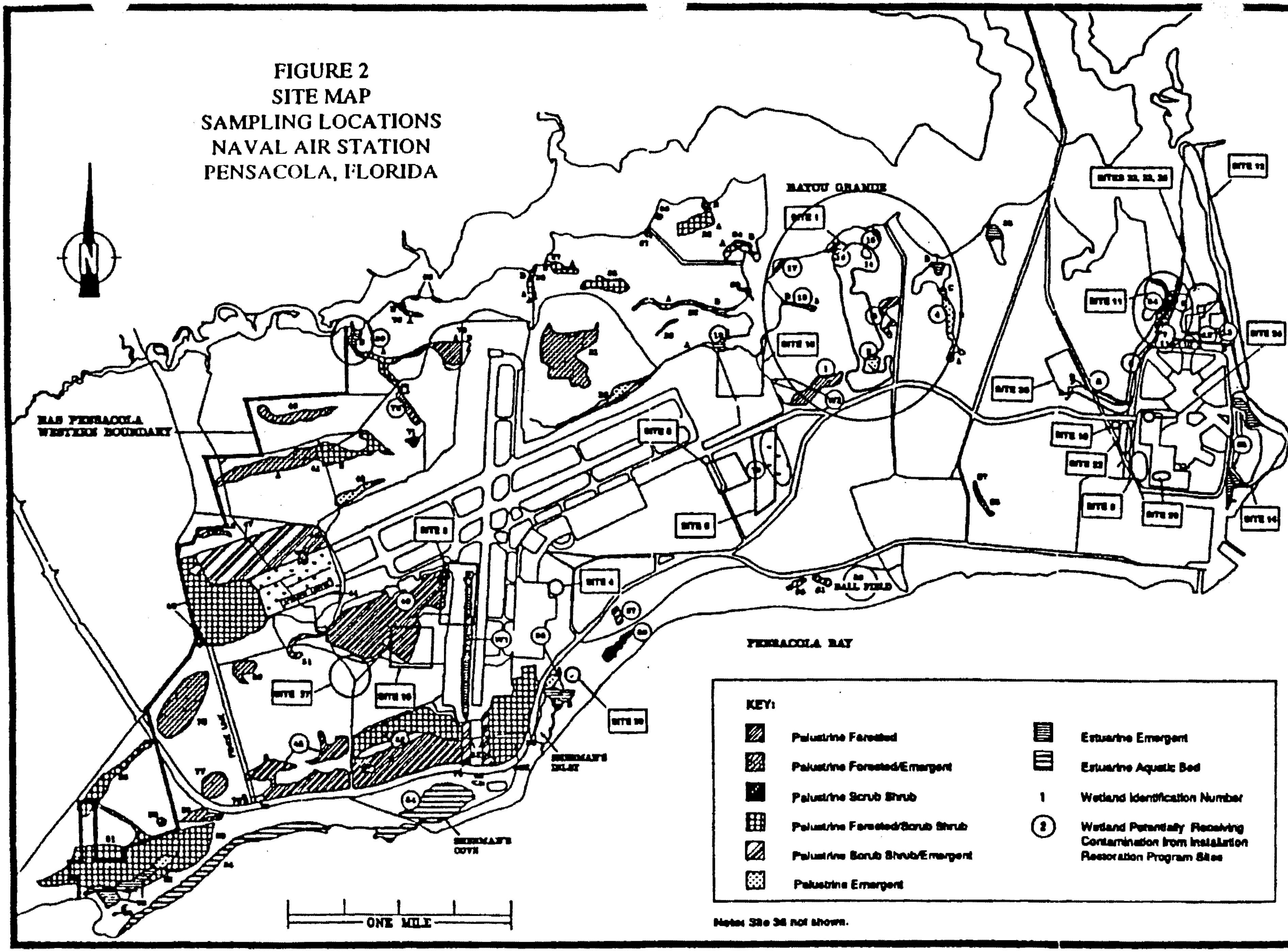


FIGURE 1
SITE LOCATION MAP
NAVAL AIR STATION
PENSACOLA, FLORIDA

FIGURE 2
SITE MAP
SAMPLING LOCATIONS
NAVAL AIR STATION
PENSACOLA, FLORIDA



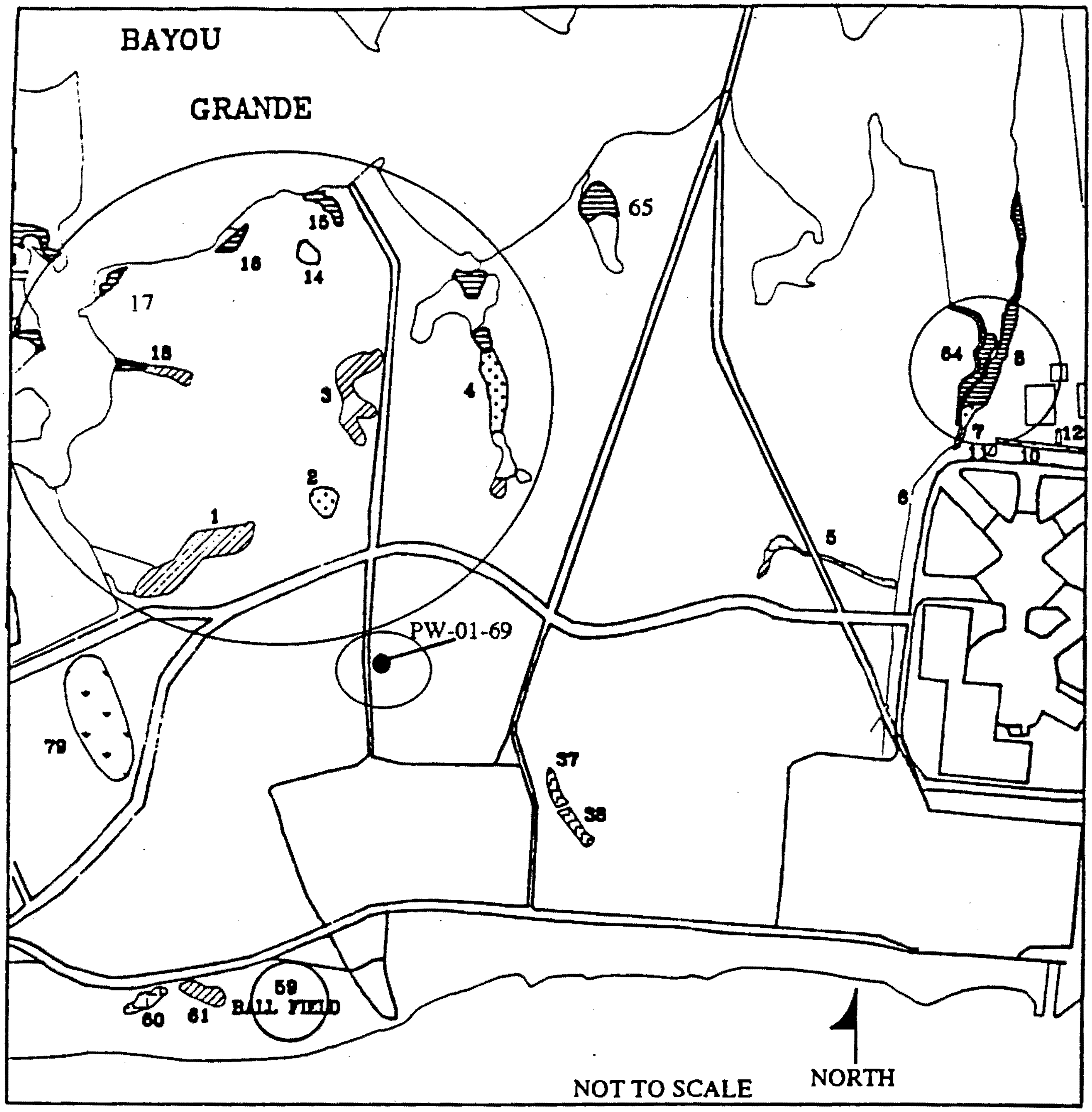


FIGURE 3
Site Map
Sampling Locations
Naval Air Station
Pensacola, Florida

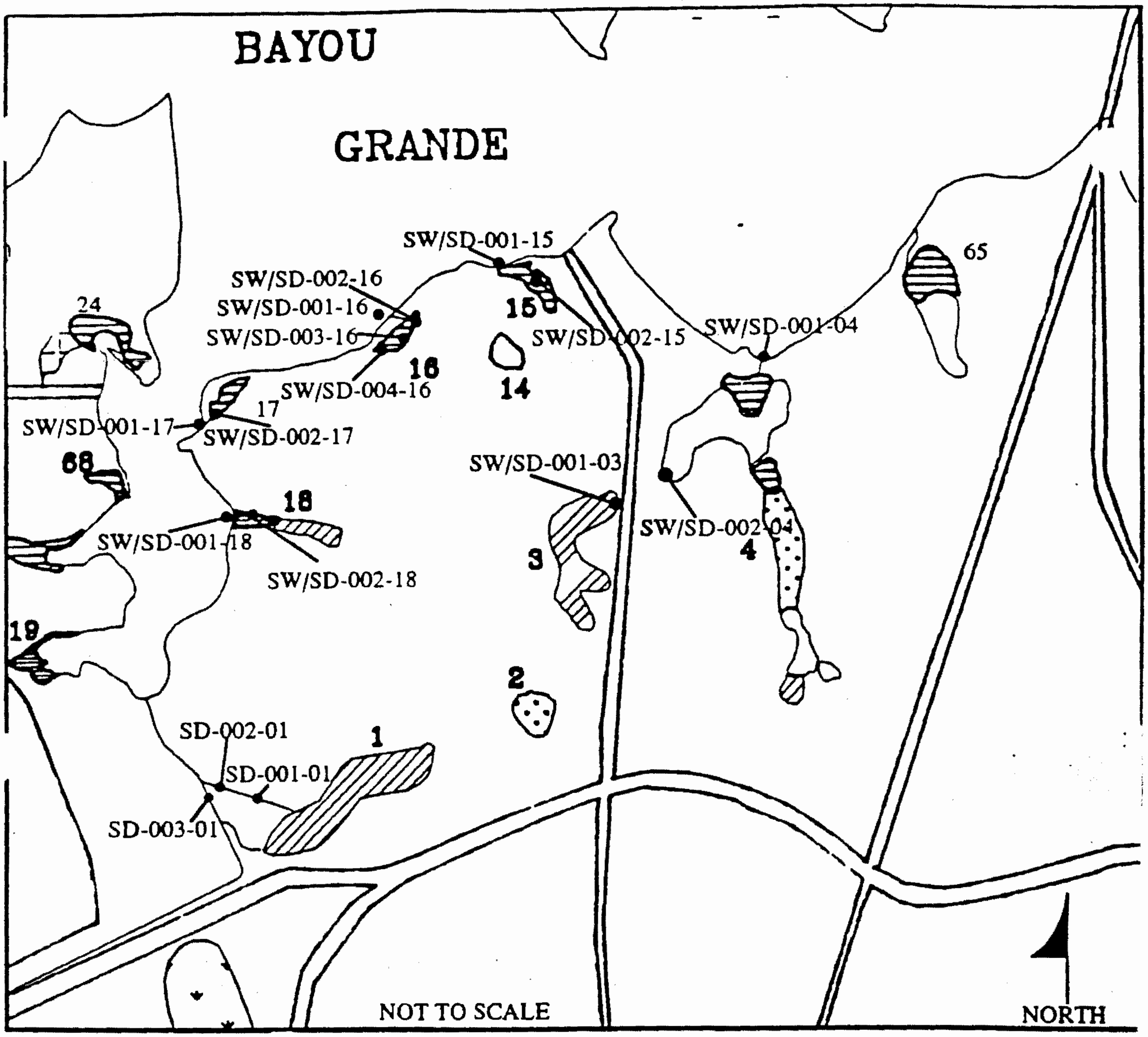


FIGURE 4
Site 1 Sampling Stations
Naval Air Station
Pensacola, Florida

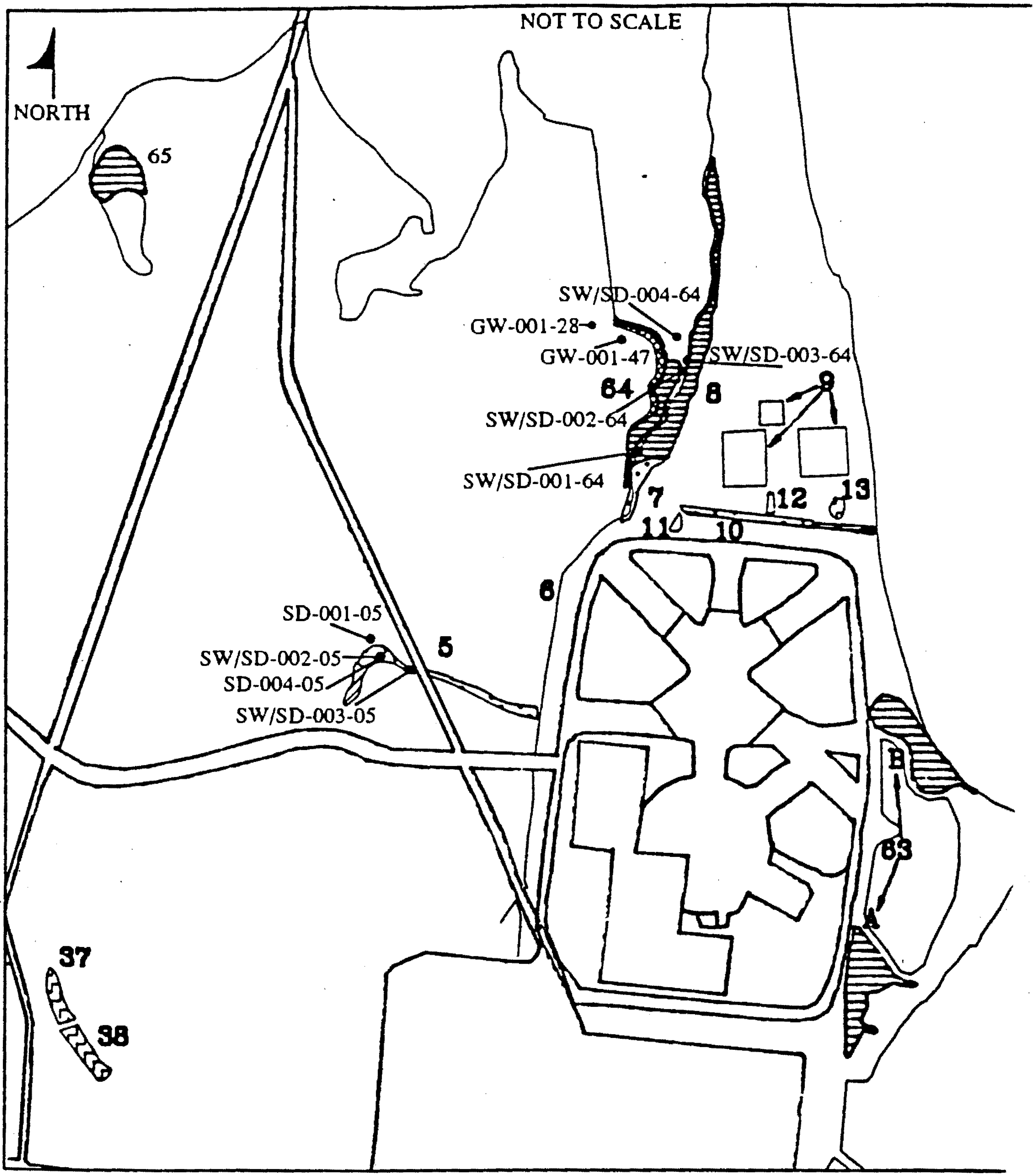
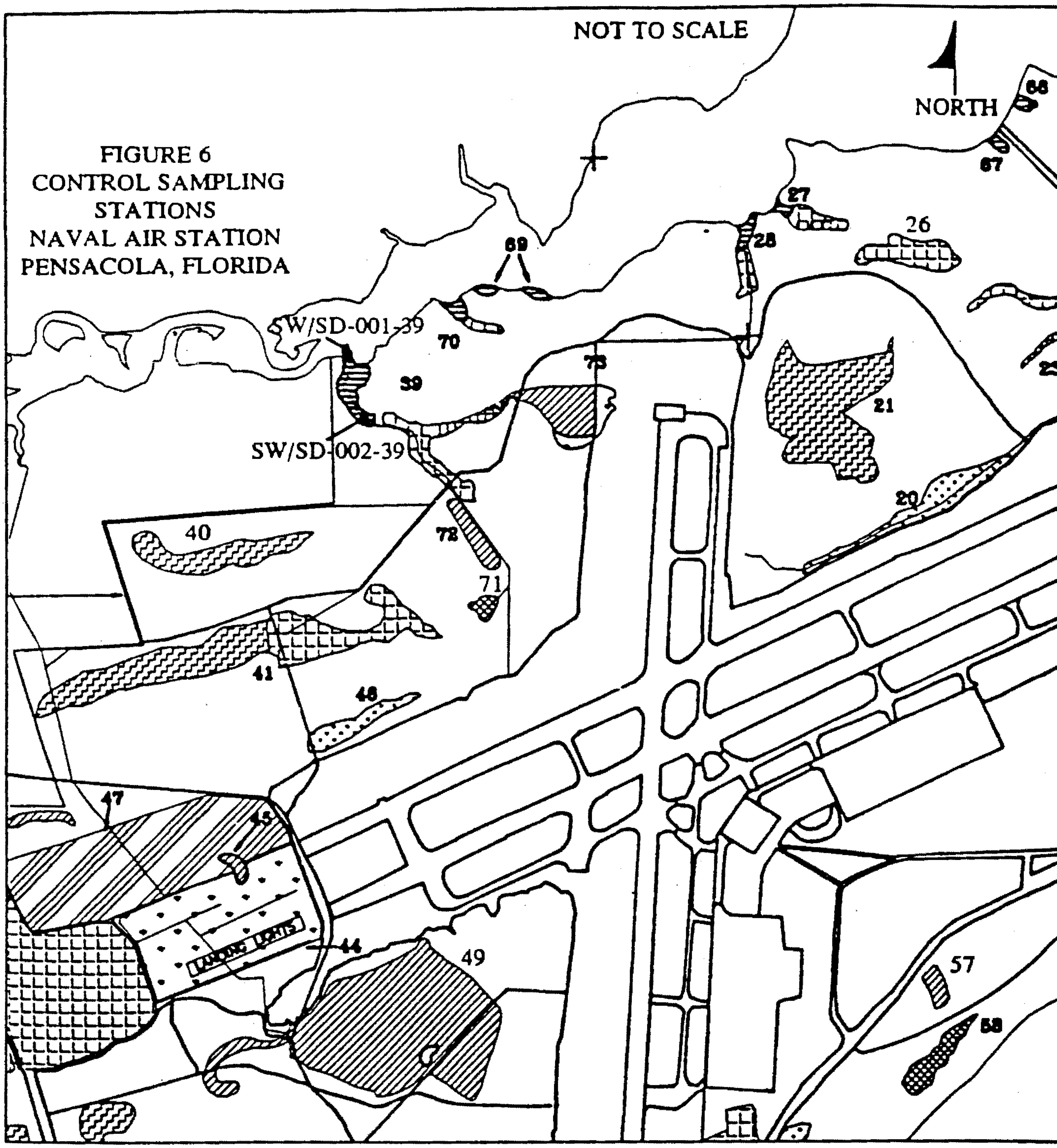


FIGURE 5
Site 1 and Site 30 Sampling Stations
Naval Air Station
Pensacola, Florida


NOT TO SCALE
NORTH
FIGURE 6
CONTROL SAMPLING
STATIONS
NAVAL AIR STATION
PENSACOLA, FLORIDA
SW/SD-001-39
SW/SD-002-39
LANDING LIGHTS
66
67
27
26
28
69
70
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APPENDIX B

ANALYTICAL DATA TABLES

TABLE 1
ANALYTICAL DATA SUMMARY
NAVAL AIR STATION PENSACOLA
PENSACOLA FLORIDA
JULY, 1992

	SW00118 BAYOU GRANDE 07/14/92 1530	SW00218 WETLAND #18 07/14/92 1600	SW00117 BAYOU GRANDE 07/14/92 1700	SW00217 WETLAND #17 07/14/92 1705	SW00116 BAYOU GRANDE 07/14/92 1910	SW00216 WETLAND #16 07/15/92 1430	SW00316 WETLAND #16 07/15/92 1505	SW00416 WETLAND #16 07/15/92 1530	SW00115 BAYOU GRANDE 07/14/92 1535	SW00215 WETLAND #15 07/14/92 1420	SW00104 BAYOU GRANDE 07/14/92 1930	SW00204 WETLAND #4 07/15/92 1150	SW00103 WETLAND #3 07/15/92 1430
INORGANIC ELEMENTS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
BARIUM	--	--	--	--	27J	50	37	--	--	46J	--	34	34J
LEAD	11	10	--	--	--	--	--	--	--	10	--	14	14J
MERCURY	--	--	--	--	--	0.34	--	--	0.26	--	--	--	--
ALUMINUM	--	--	--	--	640J	--	--	--	--	--	--	--	--
MANGANESE	59	110	26	22	49J	62	52	56	41	200J	36	160	150J
CALCIUM	100000	58000	210000	200000	200000J	210000	220000	210000	220000	110000J	180000	42000	33000J
MAGNESIUM	330000	180000	710000	680000	660000J	650000	700000	680000	750000	230000J	610000	24000	2500J
IRON	4300	14000	320	220	1200J	790	710	870	460	6100J	540	11000	12000J
SODIUM	2600000	1500000	6000000	5700000	5700000J	5700000	5900000	5700000	6300000	2000000J	5300000	180000	7200J
POTASSIUM	100000	59000	220000	210000	200000J	200000	220000	210000	230000	79000J	190000	8600	1700J
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDE\PCB COMPOUNDS	--	--	--	--	--	--	--	--	--	--	--	--	--
EXTRACTABLE ORGANIC COMPOUNDS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
BENZYL BUTYL PHTHALATE	--	--	--	--	--	--	--	--	--	15	--	--	--
(DIMETHYLETHYL)PHENOL	--	5JN	--	--	--	--	--	--	--	--	--	--	--
BUTYLIDENEBIS[(DIMETHYLETHYL)METHYLPHENOL]	--	--	--	4JN	--	--	--	--	--	--	--	--	--
6 UNIDENTIFIED COMPOUNDS	--	--	--	--	--	30000J	--	--	--	--	--	--	--
PETROLEUM PRODUCT	--	--	--	--	--	N	--	--	--	--	--	--	--
1 UNIDENTIFIED COMPOUND	--	--	--	--	--	--	--	--	--	10J	--	--	--
BIPHENYLOL	--	--	--	--	--	--	--	--	--	2JN	--	--	--
BENZOPHENONE	--	--	--	--	--	--	--	--	--	6JN	--	--	--
OCTAHYDRODIMETHYL(METHYLETHYL)PHENANTHRENE	--	--	--	--	--	--	--	--	--	*	--	--	--
CARBOXYLIC ACID, METHYLESTER	--	--	--	--	--	--	--	--	--	30JN	--	--	--
PURGEABLE ORGANIC COMPOUNDS	--	--	--	--	--	--	--	--	--	--	--	--	--

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FOOTNOTES
J - ESTIMATED VALUE
N - PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
-- - MATERIAL WAS ANALYZED FOR BUT NOT DETECTED

TABLE 2
ANALYTICAL DATA SUMMARY
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA
JULY, 1992

	SD00118 BAYOU GRANDE 07/14/92 1540	SD00218 WETLAND #18 07/14/92 1605	SD00117 BAYOU GRANDE 07/14/92 1715	SD00217 WETLAND #17 07/14/92 1720	SD00116 BAYOU GRANDE 07/14/92 1920	SD00216 WETLAND #16 07/15/92 1445	SD00316 WETLAND #16 07/15/92 1520	SD00416 WETLAND #16 07/15/92 1535	SD00115 BAYOU GRANDE 07/14/92 1545	SD00215 WETLAND #15 07/14/92 1430	SD00104 BAYOU GRANDE 07/14/92 1940	SD00204 WETLAND #4 07/15/92 1200	SD00103 WETLAND #3 07/15/92 1440
INORGANIC ELEMENTS	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
SILVER	--	--	--	--	--	11	--	--	--	--	--	--	12
ARSENIC	4.4	--	--	--	--	8.9	16	--	--	--	--	13	18
BARIUM	--	--	--	--	--	12	30	--	--	14	--	--	92
CHROMIUM	6.8J	50J	--	--	--	22J	69J	23J	--	21J	3.1J	30J	23J
COPPER	--	--	--	--	--	38	140	--	--	--	--	--	--
LEAD	5.9	49	4.4	1.5	2.4	200	170	36	1.8	19	12	65	42
VANADIUM	--	--	--	--	--	--	--	--	--	--	--	--	52
ZINC	17J	--	--	--	--	1000J	490J	140J	--	--	--	39J	38J
ALUMINUM	2600	13000	590	280	310	2600	11000	2100	180	22000	300	4600	15000
MANGANESE	15	26	--	--	--	120	310	150	--	42	--	41	250
CALCIUM	1600	4000	--	--	--	5800	4300	130000	250	5200	--	910	29000
MAGNESIUM	190	6400	320	190	200	2300	5200	1000	170	8900	170	1500	730
IRON	18000J	29000J	740J	740J	500J	3400J	46000J	3000J	240J	20000J	250J	7800J	260000J
SODIUM	550	22000	1500	13000	1200	5600	24000	2000	1200	39000	990	4100	330
POTASSIUM	80	1400	--	--	--	350	1900	160	--	3300	--	650	--
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--
PESTICIDE/PCB COMPOUNDS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
4,4'-DDT (P,P'-DDT)	160C	380C	--	--	--	12JN	7.5	--	--	--	--	18	13
4,4'-DDE (P,P'-DDE)	29	140C	2.3JN	--	--	210C	3.7J	4.2J	--	--	--	11	8.9N
4,4'-DDD (P,P'-DDD)	44	340C	--	--	--	440C	11	--	--	--	--	22	17
GAMMA-CHLORDANE /2	--	--	--	--	--	--	--	--	--	--	--	3.5	--
EXTRACTABLE ORGANIC COMPOUNDS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
PHENANTHRENE	--	--	--	--	--	--	--	--	47J	--	170J	--	--
FLUORANTHENE	--	--	--	--	--	330J	54J	--	50J	--	640	--	--
PYRENE	--	--	--	--	--	--	--	--	39J	--	660	--	--
BENZO(A)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	660	--	--
CHRYSENE	--	--	--	--	--	--	--	--	--	--	580	--	--
BENZO(B AND/OR K)FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	1600	--	--
BENZO-A-PYRENE	--	--	--	--	--	--	--	--	--	--	750	--	--
4 UNIDENTIFIED COMPOUNDS	6000J	--	--	--	--	--	--	--	--	--	--	--	--
6 UNIDENTIFIED COMPOUNDS	--	--	7000J	--	--	--	--	--	--	--	--	--	--
CYCLOHEXYLBENZENE	--	--	--	--	--	300JN	--	--	--	--	--	--	--
HEXADECANOIC ACID	2000JN	--	--	--	--	500JN	--	--	200JN	--	--	--	--

TABLE 2 (CONTINUED)
ANALYTICAL DATA SUMMARY
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA
JULY, 1992

	SD00118 BAYOU GRANDE 07/14/92 1540	SD00218 WETLAND #18 07/14/92 1605	SD00117 BAYOU GRANDE 07/14/92 1715	SD00217 WETLAND #17 07/14/92 1720	SD00116 BAYOU GRANDE 07/14/92 1920	SD00216 WETLAND #16 07/15/92 1445	SD00316 WETLAND #16 07/15/92 1520	SD00416 WETLAND #16 07/15/92 1535	SD00115 BAYOU GRANDE 07/14/92 1545	SD00215 WETLAND #15 07/14/92 1430	SD00104 BAYOU GRANDE 07/14/92 1940	SD00204 WETLAND #4 07/15/92 1200	SD00103 WETLAND #3 07/15/92 1440
EXTRACTABLE ORGANIC COMPOUNDS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
PHOSPHORIC ACID, TRIS(ETHYLHEXYL)ESTER	--	--	--	--	--	3000JN	--	--	--	--	--	--	--
2 UNIDENTIFIED COMPOUNDS	--	2000J	--	--	--	2000J	--	--	--	--	--	--	--
1 UNIDENTIFIED COMPOUND	--	--	--	900J	500J	--	--	700J	--	--	600J	--	--
3 UNIDENTIFIED COMPOUNDS	--	--	--	--	--	--	--	--	--	2000J	--	--	--
BENZOFLUORANTHENE (NOT B OR K)	--	--	--	--	--	--	--	--	--	--	700JN	--	--
13 UNIDENTIFIED COMPOUNDS	--	--	--	--	--	--	--	--	--	--	--	10000J	--
CARINE	--	--	--	--	--	--	--	--	--	--	--	200JN	--
OCTAHYDROMETHYLMETHYLENE(METHYLETHYL)	--	--	--	--	--	--	--	--	--	--	--	*	--
NAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	400JN	--
PETROLEUM PRODUCT	--	--	--	--	--	--	--	--	--	--	--	--	N
15 UNIDENTIFIED COMPOUNDS	--	--	--	--	--	--	--	--	--	--	--	--	20000J
PURGEABLE ORGANIC COMPOUNDS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
CHLOROFORM	--	5J	--	--	--	--	3J	--	--	--	--	--	--
CHLOROBENZENE	--	--	--	--	--	--	7J	--	--	--	--	--	--

****

FOOTNOTES
J - ESTIMATED VALUE
N - PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
-- - MATERIAL WAS ANALYZED FOR BUT NOT DETECTED
C - CONFIRMED BY GC/MS

TABLE 3
ANALYTICAL DATA SUMMARY
NAVAL AIR STATION PENSACOLA
PENSACOLA FLORIDA
JULY, 1992

	SW00164 WETLAND #64 07/15/92 1725	SW00264 WETLAND #64 07/15/92 1745	SW00364 WETLAND #64 07/15/92 1810	SW00464 BAYOU GRANDE 07/15/92 1835
INORGANIC ELEMENTS	UG/L	UG/L	UG/L	UG/L
BARIUM	--	26	26	26
LEAD	17	14	18	13
ZINC	120	61	55	54
ALUMINUM	630	--	--	--
MANGANESE	55	37	31	35
CALCIUM	30000	29000	26000	39000
MAGNESIUM	3400	37000	36000	78000
IRON	600	530	520	480
SODIUM	27000	310000	310000	660000
POTASSIUM	1500	12000	12000	25000
CYANIDE	--	--	--	--
PESTICIDE\PCB COMPOUNDS	--	--	--	--
EXTRACTABLE ORGANIC COMPOUNDS	UG/L	UG/L	UG/L	UG/L
BIS(2-ETHYLHEXYL) PHTHALATE	--	--	6600	--
PURGEABLE ORGANIC COMPOUNDS	UG/L	UG/L	UG/L	UG/L
1,1-DICHLOROETHANE	--	--	1J	--

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FOOTNOTES

J - ESTIMATED VALUE

-- - MATERIAL WAS ANALYZED FOR BUT NOT DETECTED

TABLE 4
ANALYTICAL DATA SUMMARY
NAVAL AIR STATION PENSACOLA
PENSACOLA FLORIDA
JULY, 1992

	SD00164 WETLAND #64 07/15/92 1735	SD00264 WETLAND #64 07/15/92 1755	SD00364 WETLAND #64 07/15/92 1820	SD00464 BAYOU GRANDE 07/15/92 1845
INORGANIC ELEMENTS	MG/KG	MG/KG	MG/KG	MG/KG
ARSENIC	--	--	--	9.6
BARIUM	--	--	--	22
CADMIUM	--	2	8.5	44
COBALT	--	--	--	6.3
CHROMIUM	2.7J	99J	550J	1400J
COPPER	--	13	21	180
NICKEL	--	--	--	22
LEAD	21	32	310	540
VANADIUM	--	--	--	34
ZINC	--	45J	55J	300J
MERCURY	--	--	--	0.48
ALUMINUM	720	540	1400	14000
MANGANESE	--	--	8.9	110
CALCIUM	1000	--	390	5800
MAGNESIUM	390	280	460	5500
IRON	3000J	710J	2300J	24000J
SODIUM	1700	1600	1700	16000
POTASSIUM	99	110	170	2000
CYANIDE	--	--	--	--
PESTICIDE/PCB COMPOUNDS	UG/KG	UG/KG	UG/KG	UG/KG
4,4'-DDE (P,P'-DDE)	1.4J	6.3	21	21
4,4'-DDD (P,P'-DDD)	--	11N	38N	26N
PCB-1260 (AROCLOR 1260)	--	--	74N	--
EXTRACTABLE ORGANIC COMPOUNDS	UG/KG	UG/KG	UG/KG	UG/KG
ACENAPHTHENE	--	--	130J	--
FLUORENE	--	--	72J	--
PHENANTHRENE	360J	76J	550	550
ANTHRACENE	63J	--	130J	--
FLUORANTHENE	480J	140J	710	750
PYRENE	470J	150J	780	780
BENZO(A)ANTHRACENE	220J	--	370J	340J
CHRYSENE	250J	--	360J	--
BENZO(B AND/OR K)FLUORANTHENE	--	--	650	--

TABLE 4 (CONTINUED)
ANALYTICAL DATA SUMMARY
NAVAL AIR STATION PENSACOLA
PENSACOLA FLORIDA
JULY, 1992

	SD00164 WETLAND #64 07/15/92 1735	SD00264 WETLAND #64 07/15/92 1755	SD00364 WETLAND #64 07/15/92 1820	SD00464 BAYOU GRANDE 07/15/92 1845
EXTRACTABLE ORGANIC COMPOUNDS	UG/KG	UG/KG	UG/KG	UG/KG
2,4-DIMETHYLPHENOL	--	--	130J	360J
CARBAZOLE	55J	--	110J	--
1 UNIDENTIFIED COMPOUND	1000J	--	--	--
3 UNIDENTIFIED COMPOUNDS	--	2000J	--	--
6 UNIDENTIFIED COMPOUNDS	--	--	4000J	--
20 UNIDENTIFIED COMPOUNDS	--	--	--	30000J
PETROLEUM PRODUCT	--	N	N	N
PURGEABLE ORGANIC COMPOUNDS	UG/KG	UG/KG	UG/KG	UG/KG
CARBON DISULFIDE	--	--	--	4J

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FOOTNOTES

J - ESTIMATED VALUE
N - PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
-- - MATERIAL WAS ANALYZED FOR BUT NOT DETECTED

TABLE 5
ANALYTICAL DATA SUMMARY
NAVAL AIR STATION, PENSACOLA
PENSACOLA FLORIDA
JULY, 1992

	SW00205 WETLAND #5 07/16/92 1120	SW00305 WETLAND #5 07/16/92 1200
INORGANIC ELEMENTS	UG/L	UG/L
BERYLLIUM	16J	--
CADMIUM	16J	--
COBALT	12J	--
CHROMIUM	75J	--
COPPER	26J	--
LEAD	180J	11J
ZINC	270J	130J
MANGANESE	300J	--
CALCIUM	9500J	1900J
MAGNESIUM	1800J	1200J
IRON	22000J	200J
SODIUM	3400J	27000J
POTASSIUM	1600J	430J
CYANIDE	--	--
PESTICIDE\PCB COMPOUNDS	--	--
EXTRACTABLE ORGANIC COMPOUNDS	UG/L	UG/L
11 UNIDENTIFIED COMPOUNDS	200J	--
PURGEABLE ORGANIC COMPOUNDS	UG/L	UG/L
CHLOROFORM	--	3J
BROMODICHLOROMETHANE	--	3J
DIBROMOCHLOROMETHANE	--	4J
BROMOFORM	--	2J
HEXANAL	10JN	--
ETHYLMETHYLHEPTANE	10JN	--
TRIMETHYLDECANE	20JN	--
DIMETHYLNONANE	20JN	--

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FOOTNOTES

J - ESTIMATED VALUE
N - PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
-- - MATERIAL WAS ANALYZED FOR BUT NOT DETECTED

TABLE 6
ANALYTICAL DATA SUMMARY
NAVAL AIR STATION, PENSACOLA
PENSACOLA, FLORIDA
JULY, 1992

	SD00105 WETLAND #5* 07/16/92 1030	SD00205 WETLAND #5 07/16/92 1130	SD00305 WETLAND #5 07/16/92 1205	SD00405 WETLAND #5** 07/14/92 1640
INORGANIC ELEMENTS	MG/KG	MG/KG	MG/KG	MG/KG
SILVER	--	--	10	260J
ARSENIC	--	--	--	2.2
BARIUM	--	130	--	74
CADMIUM	--	26	--	1400
COBALT	--	45	--	70
CHROMIUM	--	290J	7.6J	2600
COPPER	--	73	--	420
MOLYBDENUM	NA	NA	NA	31
NICKEL	--	81	--	750
LEAD	2.9	760	33	7100
ANTIMONY	--	--	--	23
SELENIUM	--	5.2J	--	--
TIN	NA	NA	NA	230
STRONTIUM	NA	NA	NA	34
TITANIUM	NA	NA	NA	630
VANADIUM	--	--	--	9.1
ZINC	--	540J	21J	460
MERCURY	--	1.2	--	1.8
ALUMINUM	1100	14000	650	5200
MANGANESE	--	310	--	1000
CALCIUM	--	13000	--	820
MAGNESIUM	NA	NA	NA	270
MAGNESIUM	46	1100	39	270
IRON	900J	19000J	190J	10000
SODIUM	--	240	--	NA
CYANIDE	--	--	--	NA
PESTICIDE/PCB COMPOUNDS	UG/KG	UG/KG	UG/KG	MG/KG
4,4'-DDE (P,P'-DDE)	--	27	--	--
PCB-1254 (AROCLOR 1254)	--	--	75	--
PCB-1260 (AROCLOR 1260)	--	120	--	--

TABLE 6 (CONTINUED)
ANALYTICAL DATA SUMMARY
NAVAL AIR STATION, PENSACOLA
PENSACOLA, FLORIDA
JULY, 1992

	SD00105 WETLAND #5* 07/16/92 1030	SD00205 WETLAND #5 07/16/92 1130	SD00305 WETLAND #5 07/16/92 1205	SD00405 WETLAND #5** 07/14/92 1640
EXTRACTABLE ORGANIC COMPOUNDS	UG/KG	UG/KG	UG/KG	MG/KG
2-METHYLNAPHTHALENE	--	--	--	330
NAPHTHALENE	--	--	--	44J
PHENANTHRENE	--	320J	--	--
FLUORANTHENE	--	1500	--	77J
PYRENE	--	420J	--	--
HEXADECANOIC ACID	--	10000JN	--	--
19 UNIDENTIFIED COMPOUNDS	--	100000J	--	--
6 UNIDENTIFIED COMPOUNDS	--	--	5000J	--
TETRAHYDRODIMETHYL(METHYLETHYL)	--	--	*	--
NAPHTHALENE	--	--	100JN	--
DIMETHYL(METHYLETHYL)NAPHTHALENE	--	--	300JN	--
ETHYLDIMETHYLBENZENE (2 ISOMERS)	--	--	--	400JN
TETRAMETHYLBENZENE	--	--	--	100JN
(DIMETHYLPROPYL)BENZENE (2 ISOMERS)	--	--	--	100JN
1-METHYLNAPHTHALENE	--	--	--	600JN
BIPHENYL	--	--	--	300JN
DIMETHYLNAPHTHALENE (3 ISOMERS)	--	--	--	800JN
TRIMETHYLNAPHTHALENE (3 ISOMERS)	--	--	--	600JN
PHOSPHORIC ACID, ETHYLHEXYLDIPHENYL	--	--	--	*
ESTER	--	--	--	100JN
PETROLEUM PRODUCT	--	N	--	N
PURGEABLE ORGANIC COMPOUNDS	UG/KG	UG/KG	UG/KG	MG/KG
VINYL CHLORIDE	--	--	--	24
CIS-1,2-DICHLOROETHENE	NA	NA	NA	27
TRANS-1,2-DICHLOROETHENE	NA	NA	NA	0.98J
CHLOROFORM	--	2J	2J	--
1,1,1-TRICHLOROETHANE	--	--	--	2.5J
TOLUENE	--	--	--	12
ETHYL BENZENE	--	--	--	1.7J
(M- AND/OR P-)XYLENE	NA	NA	NA	6.2J
O-XYLENE	NA	NA	NA	1.6J
ETHYLMETHYLHEPTANE	--	50JN	--	--
DIMETHYLOCTANE	--	40JN	--	--
DECANE	--	50JN	--	--
METHYLNONANE	--	80JN	--	--
METHYLPROPYLCYCLOHEXANE	--	30JN	--	--
5 UNIDENTIFIED COMPOUNDS	--	300J	--	--
TRIMETHYLBENZENE (4 ISOMERS)	--	--	--	300JN
ETHYLMETHYLBENZENE	--	--	--	70JN

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FOOTNOTES

NA - NOT ANALYZED
J - ESTIMATED VALUE
N - PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
-- - MATERIAL WAS ANALYZED FOR BUT NOT DETECTED

TABLE 7
ANALYTICAL DATA SUMMARY
NAVAL AIR STATION PENSACOLA
PENSACOLA FLORIDA
JULY, 1992

	SW00139 BAYOU GRANDE 07/15/92 1640	SW00239 WETLAND #39 07/15/92 1740
INORGANIC ELEMENTS	UG/L	UG/L
LEAD	7	6
CALCIUM	23000	25000
MAGNESIUM	64000	67000
IRON	260	310
SODIUM	2100000	550000
POTASSIUM	20000	21000
CYANIDE	--	--
PESTICIDE/PCB COMPOUNDS	--	--
EXTRACTABLE ORGANIC COMPOUNDS	UG/L	UG/L
1 UNIDENTIFIED COMPOUND	--	20J
BIS(DIMETHYLETHYL)METHYLPHENOL	--	2JN
BUTYLIDENEBIS(DIMETHYLETHYL)METHYLPHENOL	--	8JN
PURGEABLE ORGANIC COMPOUNDS	--	--

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FOOTNOTES

J - ESTIMATED VALUE

N - PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

-- - MATERIAL WAS ANALYZED FOR BUT NOT DETECTED

TABLE 8
ANALYTICAL DATA SUMMARY
NAVAL AIR STATION PENSACOLA
PENSACOLA FLORIDA
JULY, 1992

	SD00139 BAYOU GRANDE 07/15/92 1655	SD00239 WETLAND #39 07/15/92 1750
INORGANIC ELEMENTS	MG/KG	MG/KG
LEAD	--	7.8
ALUMINUM	210	4600
CALCIUM	--	1900
MAGNESIUM	180	3200
IRON	170J	2800J
SODIUM	1200	17000
POTASSIUM	--	740
CYANIDE	--	--
PESTICIDE/PCB COMPOUNDS	--	--
EXTRACTABLE ORGANIC COMPOUNDS	UG/KG	UG/KG
DIMETHYL(METHYLETHYL)NAPHTHALENE	--	100JN
PURGEABLE ORGANIC COMPOUNDS	--	--

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FOOTNOTES
J - ESTIMATED VALUE
N - PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
-- - MATERIAL WAS ANALYZED FOR BUT NOT DETECTED

TABLE 9
ANALYTICAL DATA SUMMARY
NAVAL AIR STATION PENSACOLA
PENSACOLA FLORIDA
JULY 1992

	SD00101 WETLAND #1* 07/16/92 0910	SD00201 WETLAND #1* 07/16/92 0095	SD00301 WETLAND #1* 07/16/92 1020
INORGANIC ELEMENTS	MG/KG	MG/KG	MG/KG
CHROMIUM	2.6J	3.9J	--
LEAD	24	18	3.4
SELENIUM	--	1.2J	--
ZINC	46J	32J	--
ALUMINUM	580	920	450
MANGANESE	10	--	--
CALCIUM	890	--	210
MAGNESIUM	180	36	16
IRON	1900J	460J	190J
CYANIDE	--	--	--
PESTICIDE/PCB COMPOUNDS	UG/KG	UG/KG	UG/KG
4,4'-DDD (P,P'-DDD)	--	--	2.9JN
PCB-1260 (AROCLOR 1260)	66N	78	--
GAMMA-CHLORDANE /2	9.3	5.8	--
EXTRACTABLE ORGANIC COMPOUNDS	UG/KG	UG/KG	UG/KG
PHENANTHRENE	39J	140J	--
FLUORANTHENE	85J	200J	--
PYRENE	100J	200J	--
3 UNIDENTIFIED COMPOUNDS	1000J	2000J	--
HEXADECANOIC ACID	--	400JN	400JN
4 UNIDENTIFIED COMPOUNDS	--	--	3000J
PURGEABLE ORGANIC COMPOUNDS	--	--	--

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FOOTNOTES
NA - NOT ANALYZED
J - ESTIMATED VALUE
N - PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
-- - MATERIAL WAS ANALYZED FOR BUT NOT DETECTED

TABLE 10
ANALYTICAL DATA SUMMARY
NAVAL AIR STATION PENSACOLA
PENSACOLA FLORIDA
JULY, 1992

	GW00104 MON WELL #4 07/15/92 1550	GW00105 MON WELL #5 07/15/92 1940	GW00128 MON WELL #28 07/15/92 1140	GW00147 MON WELL #47 07/14/92 1945	PW01696 POT WELL #696 07/15/92 1400
INORGANIC ELEMENTS	UG/L	UG/L	UG/L	UG/L	UG/L
BARIUM	47	--	--	33	27
LEAD	10	8	9J	10	7
ZINC	--	--	--	--	270
MANGANESE	160	95	90J	30	--
CALCIUM	78000	26000	17000J	11000	2000
MAGNESIUM	2700	1500	5100J	1500	1400
IRON	8400	3000	3300J	2700	120
SODIUM	4000	5000	4300J	8800	30000
POTASSIUM	1200	550	1400J	550	480
EXTRACTABLE ORGANIC COMPOUNDS	UG/L	UG/L	UG/L	UG/L	UG/L
1,4-DICHLOROBENZENE	3J	--	--	--	--
2-METHYLNAPHTHALENE	--	--	6J	--	--
BIS(DIMETHYLETHYL)ETHYLMETHYLPHENOL	10JN	--	--	--	--
BIPHENYLOL	3JN	--	--	--	--
(TETRAMETHYLBUTYL)PHENOL	5JN	--	--	--	--
METHYLBENZENESULFONAMIDE (2 ISOMERS)	40JN	--	--	--	--
BENZOPHENONE	4JN	--	--	--	--
2 UNIDENTIFIED COMPOUNDS	50J	--	--	--	--
BIS(DIMETHYLETHYL)METHYLPHENOL	--	5JN	--	--	--
OCTAHYDRODIMETHYL(METHYLETHYL)PHENANTHRENE	--	*	--	--	--
CARBOXYLIC ACID, METHYLESTER	--	10JN	--	--	--
1-METHYLNAPHTHALENE	--	--	20JN	--	--
TRIMETHYLBENZOIC ACID	--	--	10JN	--	--
PETROLEUM PRODUCT	--	--	N	N	--
DIETHYLBENZENE (2 ISOMERS)	--	--	--	50JN	--
11 UNIDENTIFIED COMPOUNDS	--	--	200J	200J	--

TABLE 10 (CONTINUED)
ANALYTICAL DATA SUMMARY
NAVAL AIR STATION PENSACOLA
PENSACOLA FLORIDA
JULY, 1992

	GW00104 MON WELL #4 07/15/92 1550	GW00105 MON WELL #5 07/15/92 1940	GW00128 MON WELL #28 07/15/92 1140	GW00147 MON WELL #47 07/14/92 1945	PW01696 POT WELL #696 07/15/92 1400
PURGEABLE ORGANIC COMPOUNDS	UG/L	UG/L	UG/L	UG/L	UG/L
VINYL CHLORIDE	--	--	--	18	--
1,2-DICHLOROETHENE (TOTAL)	--	--	2J	3J	--
CHLOROFORM	--	--	--	--	2J
BROMODICHLOROMETHANE	--	--	--	--	2J
BENZENE	--	--	3J	2J	--
DIBROMOCHLOROMETHANE	--	--	--	--	3J
BROMOFORM	--	--	--	--	2J
TOLUENE	--	--	--	4J	--
CHLOROBENZENE	35	--	--	--	--
ETHYL BENZENE	--	--	--	20	--
TOTAL XYLENES	--	--	--	45	--
DIMETHYLPENTANE	20JN	--	--	--	--
TRIMETHYLPENTANE (2 ISOMERS)	90JN	--	--	--	--
DIMETHYLHEPTANE	60JN	--	--	--	--
2 UNIDENTIFIED COMPOUNDS	80J	--	--	--	--
BROMOHEPTANE	--	--	20JN	--	--
TRIMETHYLPENTANE	--	--	20JN	--	--
METHYLCYCLOPENTANE	--	--	10JN	70JN	--
CYCLOHEXANE	--	--	20JN	100JN	--
METHYLCYCLOHEXANE	--	--	30JN	100JN	--
PROPYLBENZENE	--	--	6JN	30JN	--
TRIMETHYLBENZENE (2 ISOMERS)	--	--	--	300JN	--
ETHYLMETHYLBENZENE (3 ISOMERS)	--	--	--	70JN	--

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FOOTNOTES

J - ESTIMATED VALUE
N - PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
-- - MATERIAL WAS ANALYZED FOR BUT NOT DETECTED

APPENDIX C

SAMPLE DESCRIPTIONS AND SUMMARIES

SUMMARY OF SAMPLES WETLAND No. 15			
Station	Date	Time	Description
SW-001-15	7/14/92	1535	Bayou Grande, at the outlet of wetland #15. Collected amid emergent grasses.
SD-001-15	7/14/92	1545	Bayou Grande, at the outlet of wetland #15. Collected amid emergent grasses. Sandy material with some black fines.
SW-002-15	7/14/92	1420	Wetland #15, south of inlet. Collected in open water.
SD-002-15	7/14/92	1430	Wetland #15, south of inlet. Collected in open water. Very fine black organic muck mixed with coarse sand.

These samples were collected as the tide was moving out strongly. No areas of visible leachate or waste disposal were noted.

SUMMARY OF SAMPLES WETLAND No. 16			
Station	Date	Time	Description
SW-001-16	7/14/92	1910	Bayou Grande, at the outlet of wetland #16. Collected in open water.
SD-001-16	7/14/92	1920	Bayou Grande, at the outlet of wetland #16. Collected in open water. Sand.
SW-002-16	7/15/92	1430	Wetland #16, south of inlet. Near south shoreline. The shoreline near this sample was covered with trash, rubble and discolored soil. Some oil was noted on the water.
SD-002-16	7/15/92	1445	Wetland #16, south of inlet. Near south shoreline. The shoreline near this sample was covered with trash, rubble and discolored soil. Some oil was noted on the water. The sample was a black organic muck mixed with shingles.
SW-003-16	7/15/92	1505	Wetland #16, south by southwest of inlet. Surface water at this station was grey in color. Debris was present on shore and beneath water surface.
SD-003-16	7/15/92	1520	Wetland #16, south by southwest of inlet. Surface water at this station was grey in color. Debris was present on shore and beneath water surface. The sample was very black fines mixed with some debris.
SW-004-16	7/15/92	1530	Wetland #16, southwest of inlet. A sweet odor was noted in this area prior to sampling, but not during sampling. No debris etc. was noted in this area.
SD-004-16	7/15/92	1535	Wetland #16, southwest of inlet. A sweet odor was noted in this area prior to sampling, but not during sampling. No debris etc. was noted in this area.

These samples were collected as the tide was moving out strongly. Samples collected 7/15/92 were collected during steady rain.

SUMMARY OF SAMPLES WETLAND No. 1			
Station	Date	Time	Description
SD-001-01	7/16/92	0910	Collected in ditch 20 feet upgradient of dirt road, east of flightline. No surface water present. Sample is tan to grey sand with some organic material and concrete present.
SD-002-01	7/16/92	0955	Collected in ditch 100 feet downgradient of dirt road. No surface water present. Sample is sandy, and brown in color. Some organic material present.
SD-003-01	7/16/92	1020	Collected from stream, approximately 150 feet south of NPDES outfall No. 4. Sample is sandy, and light brown to tan in color.

No visible leachate or other evidence of waste disposal was seen in this area.

SUMMARY OF SAMPLES WETLAND No. 18			
Station	Date	Time	Description
SW-001-18	7/14/92	1530	Bayou Grande, at the inlet to wetland #18.
SD-001-18	7/14/92	1540	Bayou Grande, at the inlet to wetland #18. Surficial material was a tan colored sand, below that a black colored material was predominant. Both were placed in sample.
SW-002-18	7/14/92	1600	Wetland #18, near observation deck.
SD-002-18	7/14/92	1605	Wetland #18, near observation deck. Sample collected with handheld spoon, not hand auger. Sample contained much organic material.

No visible leachate or other evidence of waste disposal was seen in this area. Samples were collected while the tide was running out strongly.

SUMMARY OF SAMPLES WETLAND No. 17			
Station	Date	Time	Description
SW-001-17	7/14/92	1700	Bayou Grande at the inlet to wetland #17.
SD-001-17	7/14/92	1715	Bayou Grande at the inlet to wetland #17. Sample was a tan, sandy sediment.
SW-002-17	7/14/92	1705	Wetland #17, at tip of sandbar.
SD-002-17	7/14/92	1720	Wetland #17, at tip of sandbar. Discolored orange sand layer present above tan sand. Orange sand had the appearance of leachate staining.

Samples collected while the tide was moving out strongly. Leachate staining was observed in the area of the bridge spanning the inlet.

SUMMARY OF SAMPLES WETLAND Nos. 3 & 4			
Station	Date	Time	Description
SW-001-04	7/14/92	1930	Bayou Grande at the inlet to wetland #4.
SD-001-04	7/14/92	1940	Bayou Grande at the inlet to wetland #4. Sample was a tan, sandy sediment.
SW-002-04	7/15/92	1150	Wetland #4, at culvert crossing beneath fairway (drainage from wetland #3). Visible leachate.
SD-002-04	7/15/92	1200	Wetland #4, at culvert crossing beneath fairway (drainage from wetland #3). Visible leachate. Sample was black.
SW-001-03	7/15/92	1430	Wetland #3, at culvert crossing beneath John H. Tower Road and fairway to wetland #4. Strong appearance of leachate.
SD-001-03	7/15/92	1440	Wetland #3, at culvert crossing beneath John H. Tower Road and fairway to wetland #4. Strong appearance of leachate. Sample appeared to be sludge and was brown and red in color.

Samples were collected as tide was running out strongly (except Sw-002-04 and SD-002-04). Leachate staining was evident at all locations except Bayou Grande samples.

SUMMARY OF SAMPLES WETLAND No. 64			
Station	Date	Time	Description
SW-001-64	7/15/92	1725	Wetland #64, upper reach. Downgradient of concrete beam spanning headwater. Also downgradient of large storm drain which was discharging at whitish\grey material.
SD-001-64	7/15/92	1735	Wetland #64, upper reach. Downgradient of concrete beam spanning headwater. Also downgradient of large storm drain which was discharging at whitish\grey material.
SW-002-64	7/15/92	1745	Wetland #64, west shore of middle reach.
SD-002-64	7/15/92	1755	Wetland #64, west shore of middle reach. Sample was grey to black sand, some oil present.
SW-003-64	7/15/92	1810	Wetland #64, east shore of middle reach.
SD-003-64	7/15/92	1820	Wetland #64, east shore of middle reach.
SW-004-64	7/15/92	1835	Wetland #64, center of shoreside of oil skimmer.
SD-004-64	7/15/92	1845	Wetland #64, center of shoreside of oil skimmer. Sample was a black material with a rubbery texture.

These samples were collected as the tide was moving out strongly. There was moderate to heavy rainfall during the collection of these samples.

SUMMARY OF SAMPLES WETLAND No. 5			
Station	Date	Time	Description
SD-001-05	7/14/92	1030	Collected from swale adjacent to fence. Swale drains paved area at site 30 directly into wetland #5. Sample is tan to grey sand at surface, grading to yellow.
SW-002-05	7/14/92	1120	Collected from top of sump located in wetland. Light oil sheen on water.
SD-002-05	7/14/92	1130	Composite sample collected from around sump at spray heads.
SW-003-05	7/14/92	1200	Collected from upstream side of culvert crossing beneath Murray Rd.
SD-003-05	7/14/92	1205	Collected from upstream side of culvert crossing beneath Murray Rd. Sample is light grey sand grading to black.
SD-004-05	7/14/92	1640	Waste sample collected from sump found in wetland.

No areas of leachate or waste disposal were noted, with the exception of the sump-like structure, which contained a waste material.

SUMMARY OF SAMPLES WETLAND No. 39			
Station	Date	Time	Description
SW-001-39	7/15/92	1640	Bayou Grande at inlet to wetland #39. Control station.
SD-001-39	7/15/92	1655	Bayou Grande at inlet to wetland #39. Control station. Sample was sandy, and tan and black in color.
SW-002-39	7/15/92	1740	Upper reach of wetland #39. Control station.
SD-002-39	7/15/92	1750	Upper reach of wetland #39. Control station.

These samples were collected as the tide was moving out strongly. There was moderate to heavy rainfall during the collection of these samples.

Results of Groundwater Technology Government Services, Inc. Investigation
Bilgewater Treatment Plant, Naval Air Station Pensacola (NASP), Pensacola, Florida

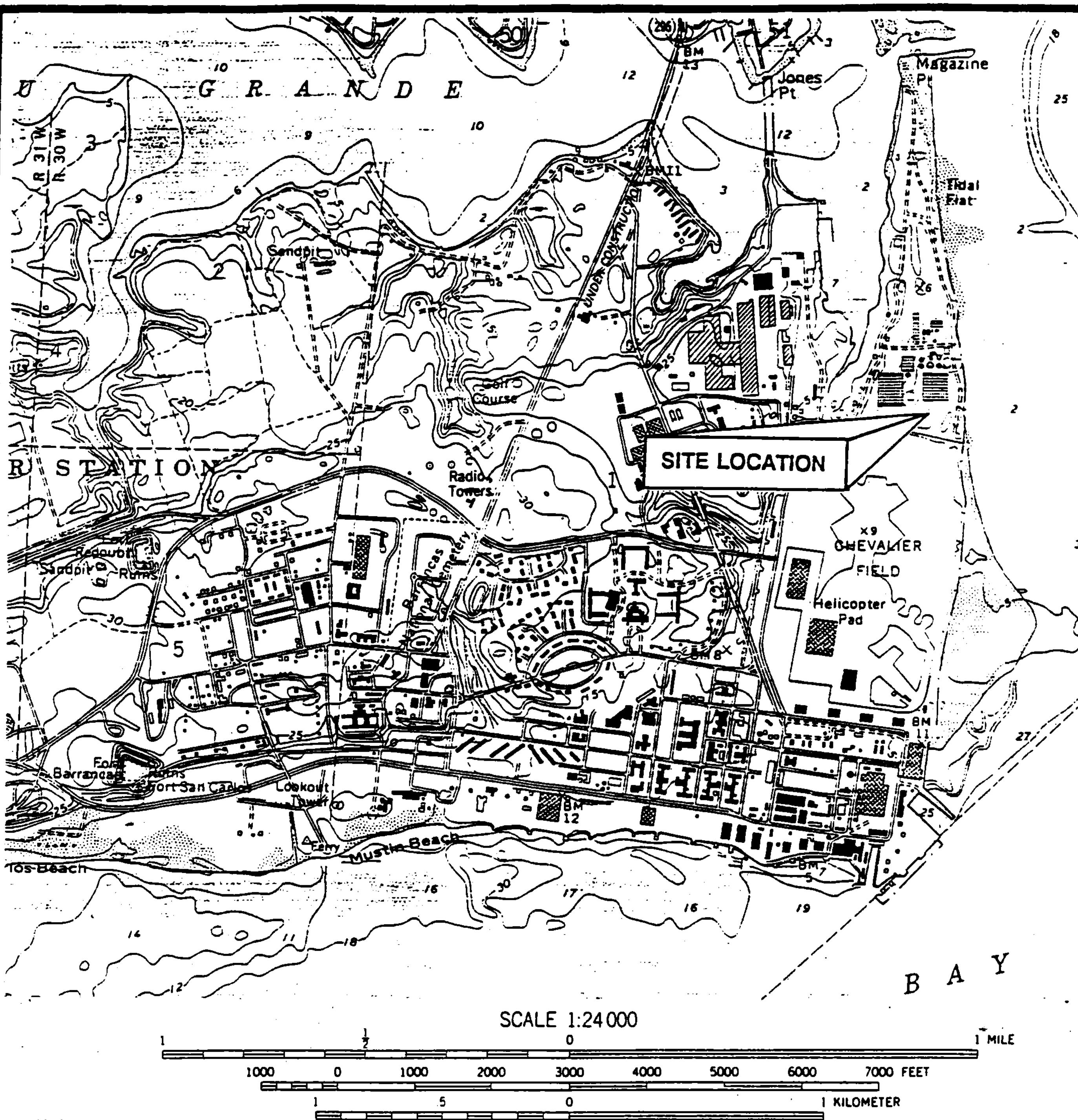


FIGURE 1

SITE LOCATION MAP

Bilgewater Treatment Plant
Pensacola Naval Air Station
Pensacola, Escambia County, Florida

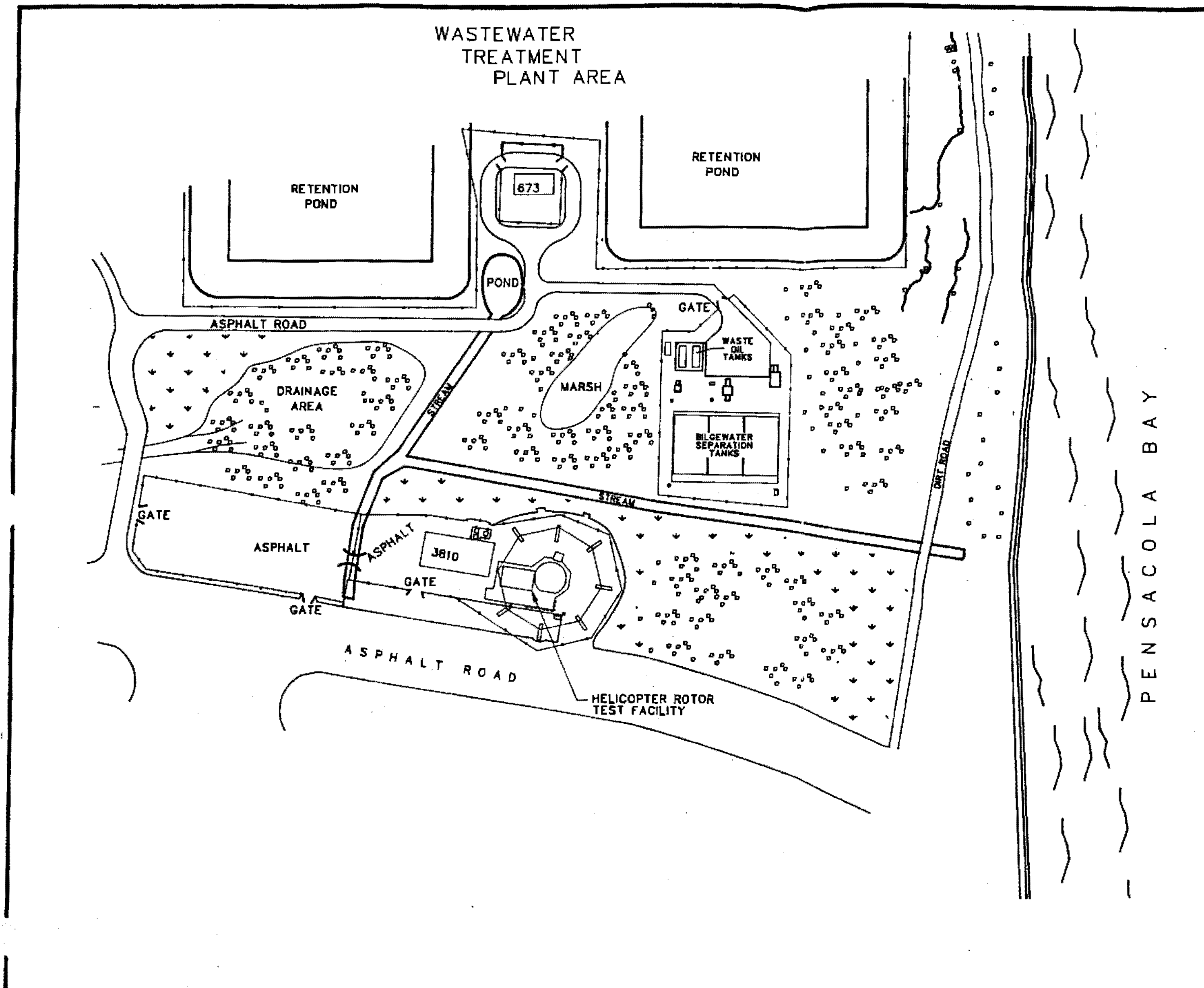
N

QUADRANGLE LOCATION

Source: USGS Quadrangle Map 7.5 Minute Series, Ft. Barrancas, Florida 1970/1987

830011089.01

GROUNDWATER TECHNOLOGY GOVERNMENT SERVICES



LEGEND

NOTES: EXISTING MONITORING WELLS NOT INSTALLED BY GROUNDWATER TECHNOLOGY GOVERNMENT SERVICES.

SOURCE: THIS MAP WAS CREATED FROM NAVFAC DRAWINGS.

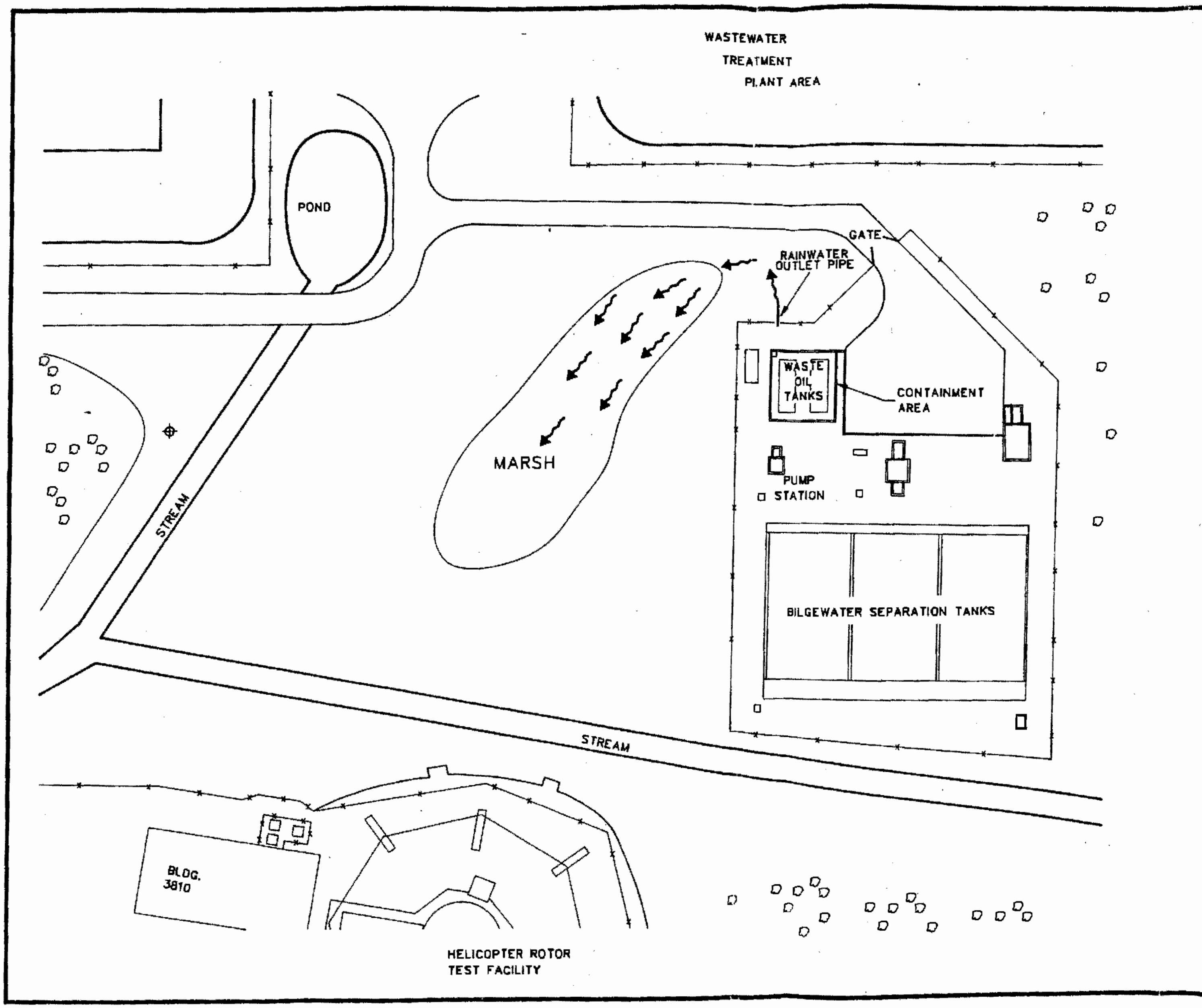
N

0 150 300

SCALE FEET

GROUNDWATER TECHNOLOGY GOVERMENT SERVICES
3700 CREIGHTON ROAD
PENSACOLA, FLORIDA 32504
(904) 4778-7128

REV. NO.: ORIG.	DRAWING DATE: 10-21-92	ACAD FILE: 8901GTI	
SITE MAP			
CLIENT: DEPARTMENT OF THE NAVY PUBLIC WORKS CENTER			PM:
LOCATION: N.A.S. PENSACOLA PENSACOLA, FLORIDA			PE/RG: DT
DESIGNED: JWH	DETAILED: GPB	PROJECT NO.: 830011089.01	FIGURE: 2



LEGEND

ACCIDENTAL RELEASE FLOW PATH DIRECTION

SOURCE: THIS MAP WAS CREATED FROM NAVFAC DRAWINGS.

N

0 60 120

SCALE FEET

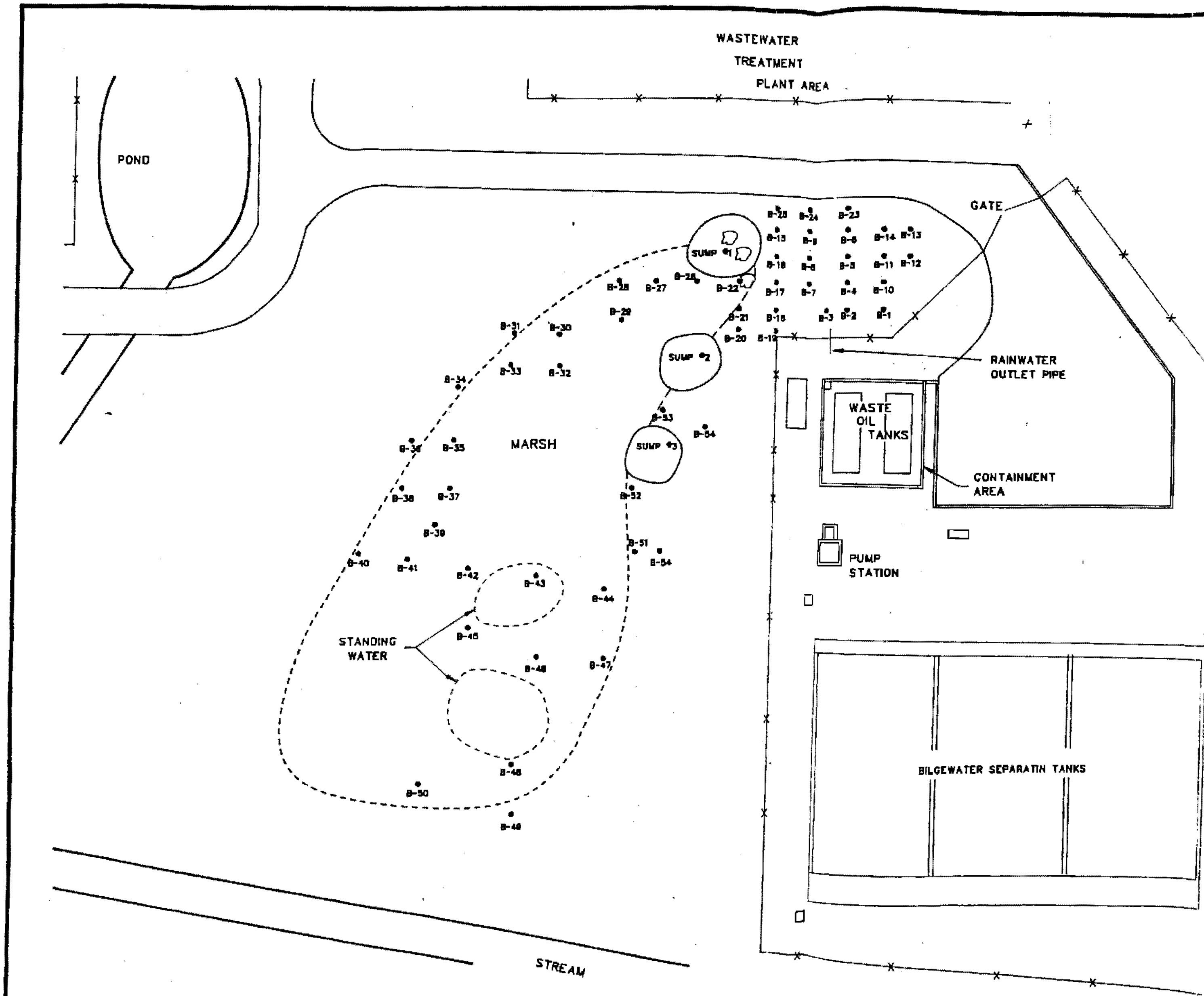
GROUNDWATER TECHNOLOGY GOVERMENT SERVICES
3700 CREIGHTON ROAD
PENSACOLA, FLORIDA 32504
(904) 4778-7128

REV. NO.:	DRAWING DATE:	ACAD FILE:
ORIG.	12-2-92	8901ARFP

ACCIDENTAL RELEASE FLOW PATH MAP

CLIENT: DEPARTMENT OF THE NAVY PUBLIC WORKS CENTER	PM:
LOCATION: N.A.S. PENSACOLA PENSACOLA, FLORIDA	PE/RG:

DESIGNED:	DETAILED:	PROJECT NO.:	FIGURE:
JWH	GPB	830011089.01	3



LEGEND

• B-49 HAND AUGER BORING LOCATION

NOTES:

SOURCE: THIS MAP WAS CREATED FROM NAVFAC DRAWINGS.

GROUNDWATER TECHNOLOGY GOVERMENT SERVICES

3700 CREIGHTON ROAD
PENSACOLA, FLORIDA 32504
(904) 4778-7128

REV. NO.:	DRAWING DATE:	ACAD FILE:
ORIG.	12-2-92	8901HAB1

HAND AUGER BORING LOCATION MAP

CLIENT: DEPARTMENT OF THE NAVY PUBLIC WORKS CENTER			PM:
LOCATION: N.A.S. PENSACOLA PENSACOLA, FLORIDA			PE/RG:
DESIGNED: JWH	DETAILED: GPB	PROJECT NO.: 830011089.01	FIGURE: 4

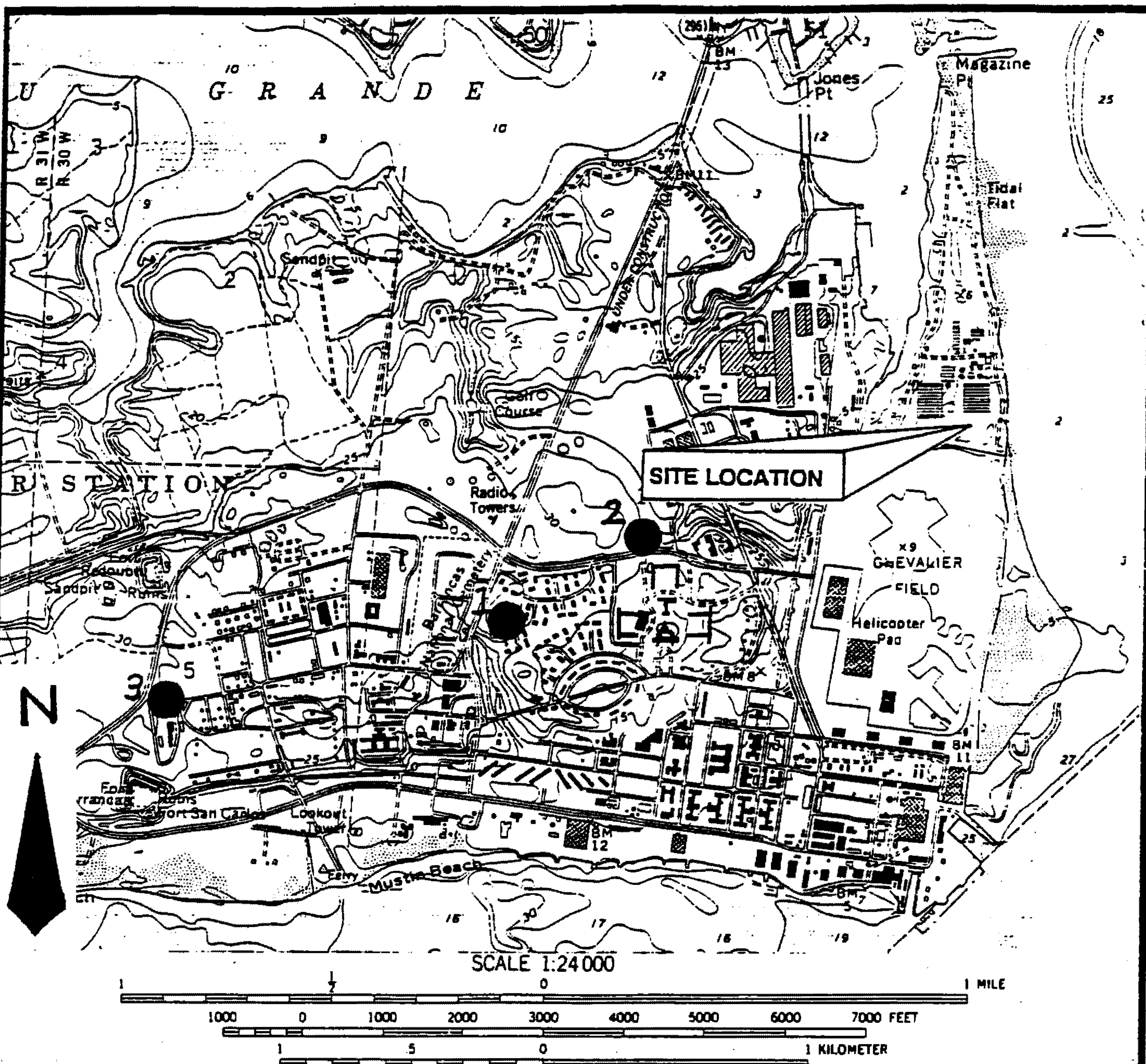


FIGURE 5

WATER WELL LOCATION MAP

Bilgewater Treatment Plant
Pensacola Naval Air Station
Pensacola, Escambia County, Florida

LEGEND

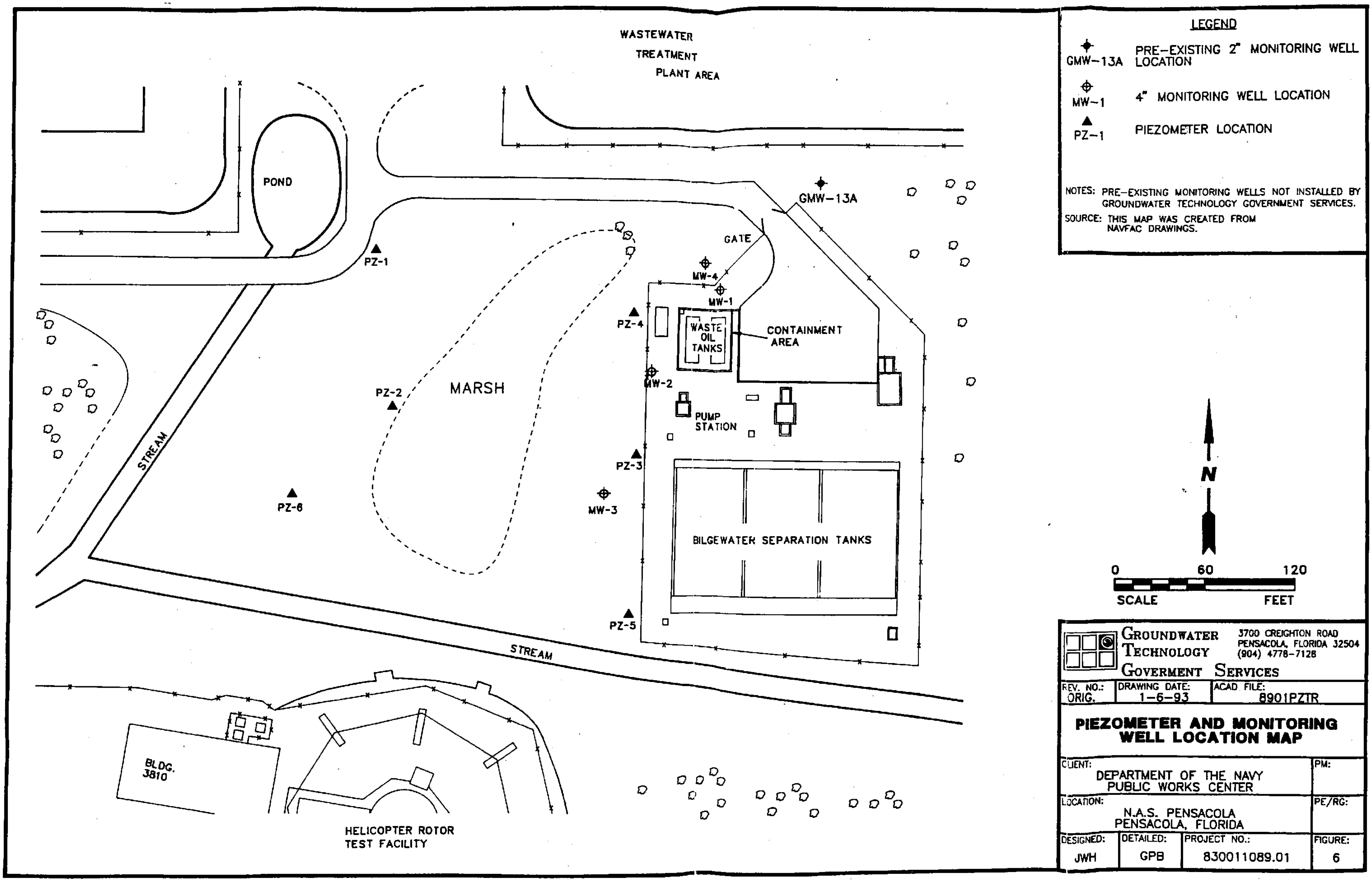
Public Supply Well

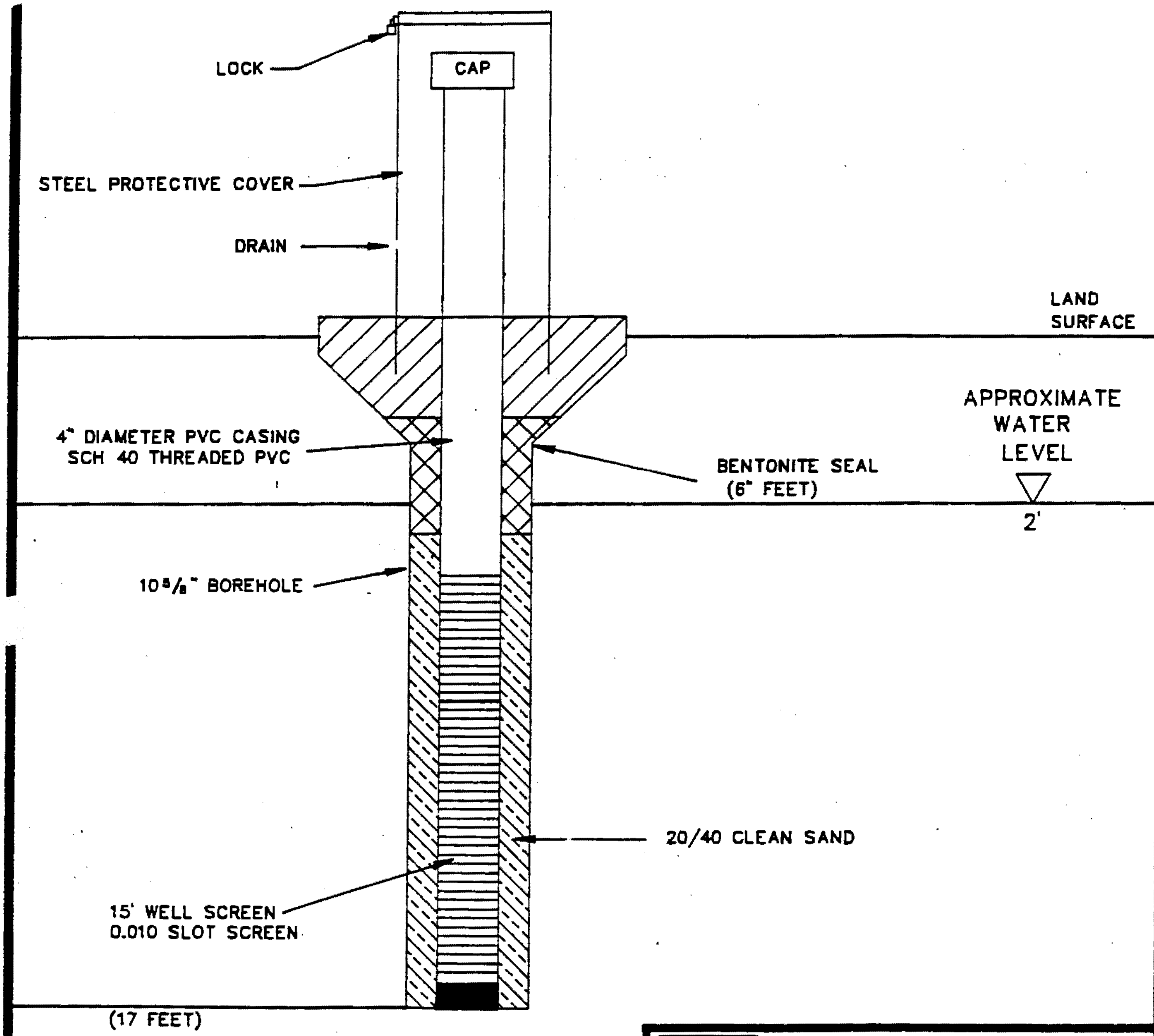
QUADRANGLE LOCATION

Source: USGS Quadrangle Map
7.5 Minute Series,
Ft. Barrancas, Florida
1970/1987

830011089.01

GROUNDWATER TECHNOLOGY GOVERNMENT SERVICES


WASTEWATER TREATMENT PLANT AREA
POND
PZ-1
GATE
GMW-13A
MW-4
MW-1
PZ-4
WASTE OIL TANKS
CONTAINMENT AREA
MW-2
PZ-2
MARSH
PUMP STATION
STREAM
PZ-3
PZ-6
MW-3
BILGEWATER SEPARATION TANKS
PZ-5
STREAM
BLDG. 3810
HELICOPTER ROTOR TEST FACILITY
LEGEND
GMW-13A PRE-EXISTING 2" MONITORING WELL LOCATION
MW-1 4" MONITORING WELL LOCATION
PZ-1 PIEZOMETER LOCATION
NOTES: PRE-EXISTING MONITORING WELLS NOT INSTALLED BY GROUNDWATER TECHNOLOGY GOVERNMENT SERVICES.
SOURCE: THIS MAP WAS CREATED FROM NAVFAC DRAWINGS.
N
0 60 120
SCALE FEET
GROUNDWATER TECHNOLOGY GOVERMENT SERVICES
3700 CREIGHTON ROAD PENSACOLA, FLORIDA 32504 (904) 4778-7128
REV. NO.: ORIG.
DRAWING DATE: 1-6-93
ACAD FILE: 8901PZTR
PIEZOMETER AND MONITORING WELL LOCATION MAP
CLIENT: DEPARTMENT OF THE NAVY PUBLIC WORKS CENTER
PM:
LOCATION: N.A.S. PENSACOLA PENSACOLA, FLORIDA
PE/RG:
DESIGNED: JWH
DETAILED: GPB
PROJECT NO.: 830011089.01
FIGURE: 6



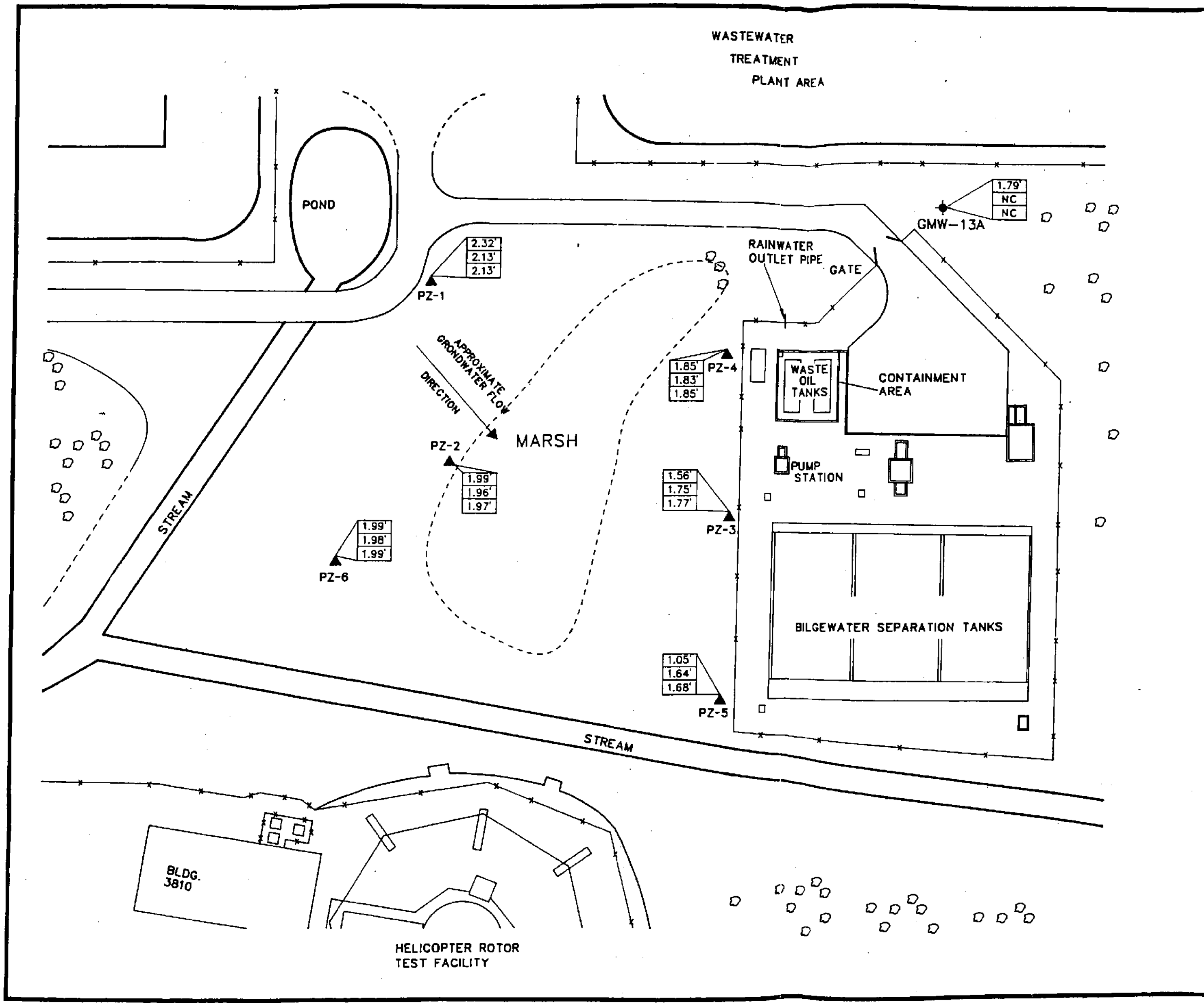
NOTE: DRAWING IS NOT TO SCALE

GROUNDWATER TECHNOLOGY GOVERNMENT SERVICES
3700 CREIGHTON ROAD
PENSACOLA, FLORIDA 32504
(904) 478-7128

DESIGNED BY:	DRAFTED BY:	APPROVED BY:	DATE:
JWH	GPB		1-8-92

TYPICAL 4" MONITORING WELL DIAGRAM

ACAD FILE:	PROJECT ID:	FIGURE NO.
8901-MW	830011089.01	7



LEGEND

GMW-13A — PRE-EXISTING 2" MONITORING WELL LOCATION

MW-1 — 4" MONITORING WELL LOCATION

PZ-1 — PIEZOMETER LOCATION

2.32' - 12/2/92
2.13' - 12/8/92
2.13' - 12/9/92
WATER TABLE ELEVATION (ABOVE MEAN SEA LEVEL)

NOTES: PRE-EXISTING MONITORING WELLS NOT INSTALLED BY GROUNDWATER TECHNOLOGY GOVERNMENT SERVICES. NC= NOT COLLECTED

SOURCE: THIS MAP WAS CREATED FROM NAVFAC DRAWINGS.

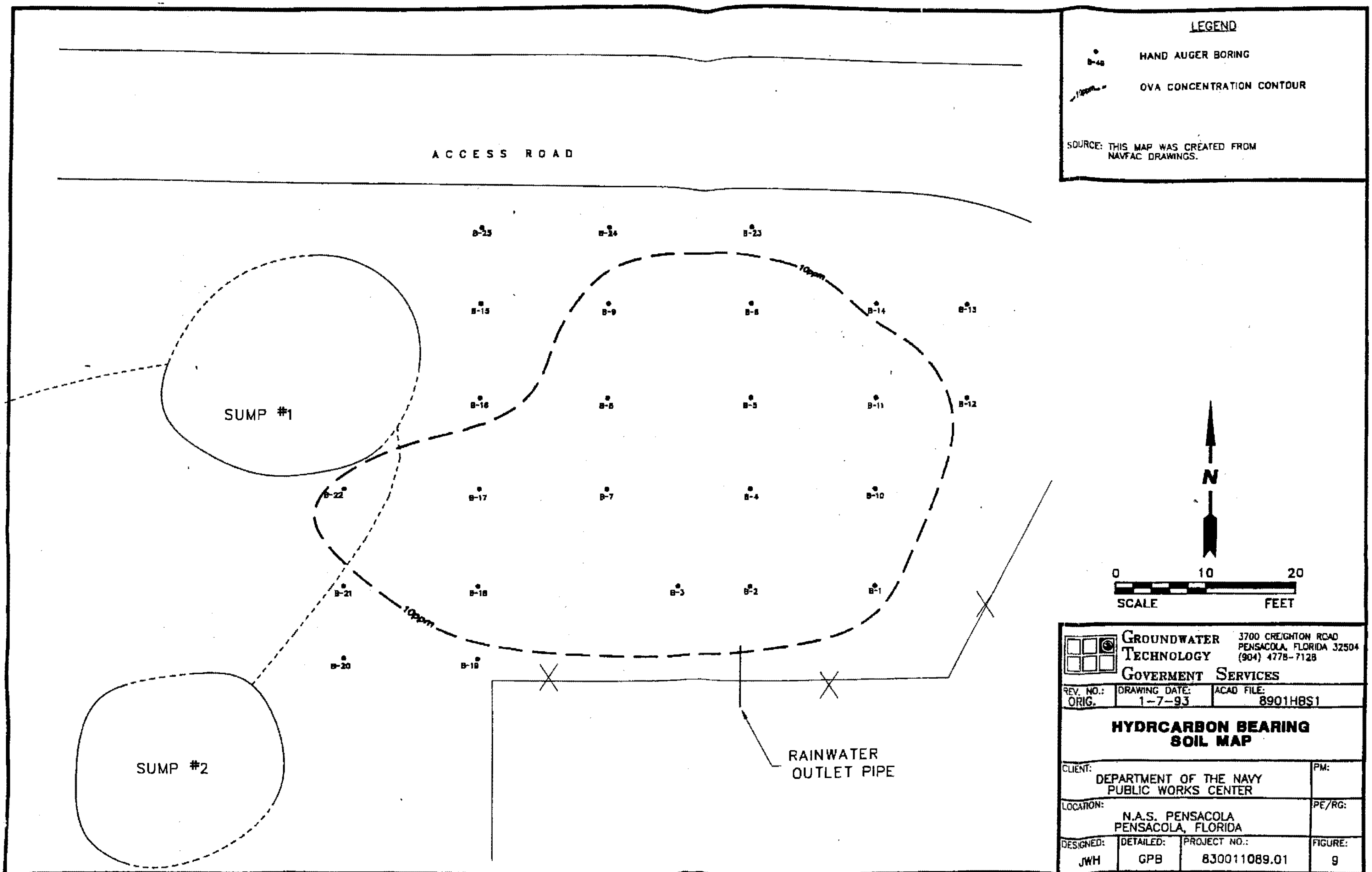
GROUNDWATER TECHNOLOGY GOVERNMENT SERVICES
3700 CREIGHTON ROAD
PENSACOLA, FLORIDA 32504
(904) 4778-7128

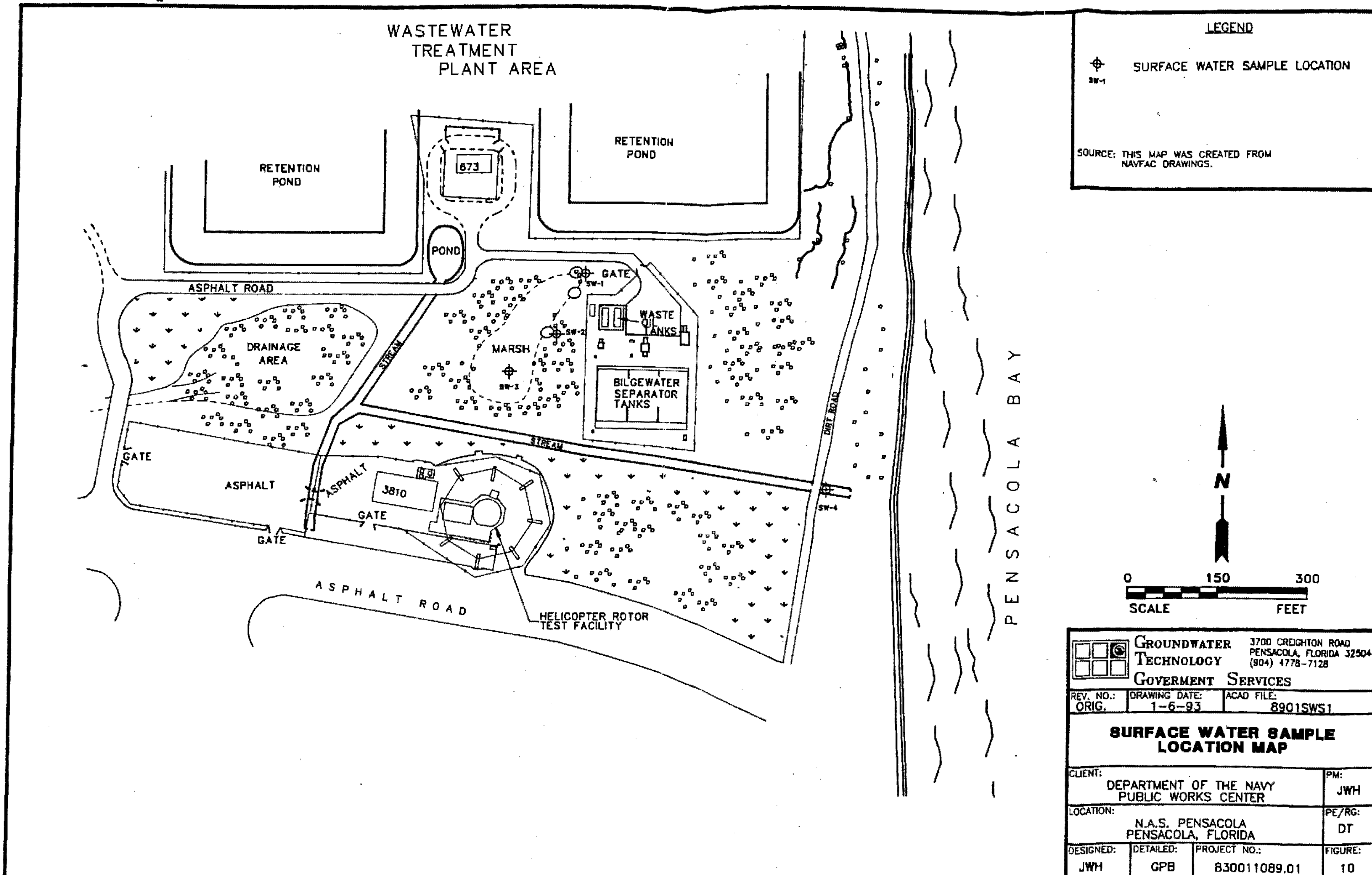
REV. NO.:	DRAWING DATE:	ACAD FILE:
ORIG.	1-11-93	8901GFD1

GROUNDWATER FLOW DIRECTION MAP

CLIENT: DEPARTMENT OF THE NAVY PUBLIC WORKS CENTER	PM:
LOCATION: N.A.S. PENSACOLA PENSACOLA, FLORIDA	PE/RG:

DESIGNED:	DETAILED:	PROJECT NO.:	FIGURE:
JWH	GPB	830011089.01	8


LEGEND
HAND AUGER BORING
OVA CONCENTRATION CONTOUR
SOURCE: THIS MAP WAS CREATED FROM NAVFAC DRAWINGS.
ACCESS ROAD
SUMP #1
SUMP #2
RAINWATER OUTLET PIPE
N
0 10 20
SCALE FEET
GROUNDWATER TECHNOLOGY GOVERMENT SERVICES
3700 CREIGHTON ROAD PENSACOLA, FLORIDA 32504 (904) 4778-7128
REV. NO.: ORIG.
DRAWING DATE: 1-7-93
ACAD FILE: 8901HBS1
HYDRCARBON BEARING SOIL MAP
CLIENT: DEPARTMENT OF THE NAVY PUBLIC WORKS CENTER
PM:
LOCATION: N.A.S. PENSACOLA PENSACOLA, FLORIDA
PE/RG:
DESIGNED: JWH
DETAILED: GPB
PROJECT NO.: 830011089.01
FIGURE: 9


WASTEWATER TREATMENT PLANT AREA
RETENTION POND
RETENTION POND
673
POND
ASPHALT ROAD
GATE
SW-1
SW-2
SW-3
SW-4
WASTE OIL TANKS
MARSH
BILGEWATER SEPARATOR TANKS
DRAINAGE AREA
STREAM
STREAM
DIRT ROAD
GATE
ASPHALT
ASPHALT
3810
GATE
GATE
ASPHALT ROAD
HELICOPTER ROTOR TEST FACILITY
PENSACOLA BAY
N
0
150
300
SCALE
FEET
LEGEND
SURFACE WATER SAMPLE LOCATION
SOURCE: THIS MAP WAS CREATED FROM NAVFAC DRAWINGS.
GROUNDWATER TECHNOLOGY GOVERMENT SERVICES
3700 CREIGHTON ROAD
PENSACOLA, FLORIDA 32504
(904) 4778-7128
REV. NO.: ORIG.
DRAWING DATE: 1-6-93
ACAD FILE: 8901SWS1
SURFACE WATER SAMPLE LOCATION MAP
CLIENT: DEPARTMENT OF THE NAVY PUBLIC WORKS CENTER
PM: JWH
LOCATION: N.A.S. PENSACOLA PENSACOLA, FLORIDA
PE/RG: DT
DESIGNED: JWH
DETAILED: GPB
PROJECT NO.: 830011089.01
FIGURE: 10

TABLES

TABLE 1

CONSTRUCTION DETAILS OF WATER-SUPPLY WELLS

NAS BILGEWATER TREATMENT PLANT
NAVAL AIR STATION, PENSACOLA

NAS FACILITY NUMBER	#1 696	#2 706	#3 1802
Year Driiied	1942	1942	1969
Depth Drilled	174' - 6"	178'	240'
Length, outside casing	106	114'	180'
Diameter, outside casing	24" - 100' 12" - 106'	24" - 110' 12" - 114'	30" - 180'
Material, outside casing	steel	steel	steel
Depth to static water level	23'	24'	45'
Normal suction lift (wkng. level)	32'	38'	69'
Normal yield, GPM	650	650	1,120
Test yield, GPM	u/k	u/k	u/k
Type of grout	cement	cement	cement
Drilling method	rotary	rotary	rotary
Type of strainer	bronze	bronze	S.S.
Depth to top of strainer	106'	114'	185'
Protection from surface water?	yes	yes	yes
Is inundation of well possible	no	no	no
Sale intrusion noted in past?	no	no	no
Has the well ever been contaminated?	no	no	no
Pump manufacturer's name	Layne Bowler	Layne Bowler	Layne Bowler
Model number	RKLC	RKLC	12 RK
Capacity GPM	750	750	750
Check valve present in line?	yes	yes	yes
Date of last servicing	routine	maint.	program
Maintenance schedule (day/mo.)	daily	daily	daily

Notes: u/k = unknown
s.s. = stainless steel

TABLE 2

GROUNDWATER ELEVATION SURVEY

NAS BILGEWATER TREATMENT PLANT
PENSACOLA NAVAL AIR STATION

DATE	STA	HI	FS	ELE	DTW	WTE
12/02/92	GMW-13A	10.74	3.29	7.45	5.66	1.79
12/02/92	P-1	10.74	3.99	6.75	4.43	2.32
12/02/92	P-2	8/84	3.84	5.00	3.01	1.99
12/02/92	P-3	8.84	1.40	7.44	5.88	1.56
12/02/92	P-4	10.74	5.29	5.45	3.60	1.85
12/02/92	P-5	10.66	3.75	6.91	5.86	1.05
12/02/92	P-6	7.62	2.64	4.98	2.99	1.99
12/08/92	P-1	10.74	3.99	6.75	4.62	2.13
12/08/92	P-2	8.84	3.84	5.00	3.04	1.96
12/08/92	P-3	8.84	1.40	7.44	5.69	1.75
12/08/92	P-4	10.74	5.29	5.45	3.62	1.83
12/08/92	P-5	10.66	7.35	6.91	5.27	1.64
12/08/92	P-6	7.62	2.64	4.98	3.00	1.98
12/09/92	P-1	10.74	3.99	6.75	4.62	2.13
12/09/92	P-2	8.84	3.84	5.00	3.03	1.97
12/09/92	P-3	8.84	1.40	7.44	5.67	1.77
12/09/92	P-4	10.74	5.29	5.45	3.60	1.85
12/09/92	P-5	10.66	3.75	6.91	5.23	1.68
12/09/92	P-6	7.62	2.64	4.98	2.99	1.99

NOTES: Assumed elevation of GMW-13A is 7.45' top of casing elevation.
STA = Stadia
HI = Height of instrument
FS = Fore sight
ELE = Elevation
DTW = Depth to water
WTE = Water table elevation
GMW = Geraghty & Miller well
P = Piezometer

TABLE 3

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS

NAS BILGEWATER TREATMENT PLANT
PENSACOLA NAVAL AIR STATION

SAMPLE ID	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	TOTAL BTEX	MTBE	Pb	TOTAL NAPHTHALENES
SW-1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
SW-2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
SW-3	BDL	1.1	BDL	BDL	BDL	BDL	BDL	BDL
SW-4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

NOTES: All results reported in parts per billion.
Total BTEX = Summation of benzene, toluene, ethyl benzene, and total xylenes
MTBE = Methyl tert-butyl ether
TPH = Total Petroleum Hydrocarbons
EDB = Ethylene dibromide
Pb = Total lead
Total Naphthalenes = Summation of naphthalene, 1, methylnaphthalene, and 2, methylnaphthalene
BDL = Below detection limits

Sample Date = December 9, 1992

TABLE 4

ORGANIC VAPOR CONTENT OF SOIL
(OVA HEADSPACE SCREENING)

NAS BILGEWATER TREATMENT PLANT
PENSACOLA NAVAL AIR STATION

I.D.	OVA
HA-1	10
HA-2	600
HA-3	900
HA-4	175
HA-5	125
HA-6	105
HA-7	1,000
HA-8	2,000
HA-9	875
HA-10	15
HA-11	250
HA-12	0
HA-13	0
HA-14	0
HA-15	0
HA-16	7.5
HA-17	30
HA-18	150
HA-19	0
HA-20	0
–	–

I.D.	OVA
HA-21	0
HA-22	1,500
HA-23	0
HA-24	4
HA-25	0.5
HA-26	1,100
HA-27	600
HA-28	850
HA-29	350
HA-30	425
HA-31	0
HA-32	900
HA-33	260
HA-34	300
HA-35	100
HA-36	80
HA-37	40
HA-38	270
HA-39	330
HA-40	10
–	–

I.D.	OVA
HA-41	350
HA-42	250
HA-43	0
HA-44	7
HA-45	0
HA-46	40
HA-47	280
HA-48	540
HA-49	0
HA-50	3
HA-51	25
HA-52	0
HA-53	3,300
HA-54	19
HA-55	11
P-1; 2'	2
P-2; 4'	2
P-2; G.C.	1
P-3; 4'	1
P-4; 1'	0
P-5; 1'	0

NOTES: All results reported in parts per million
HA = Hand auger
P = Piezometer

TABLE 5

SUMMARY OF SOIL ANALYTICAL RESULTS

NAS BILGEWATER TREATMENT PLANT
PENSACOLA NAVAL AIR STATION

DATE	SAMPLE I.D.	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	TOTAL BTEX	TPH (ppm)
12/09/92	HA-8	BDL	BDL	411	900	1,311	41,400

NOTES: All results reported in parts per billion unless otherwise noted.
ppm = Parts per million
Total BTEX = Summation of benzene, toluene, ethyl benzene and total xylenes
TPH = Total Petroleum Hydrocarbons
HA = Hand auger
BDL = Below detection limits

TABLE 6

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS

NAS BILGEWATER TREATMENT PLANT
PENSACOLA NAVAL AIR STATION

SAMPLE ID	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	TOTAL BTEX	MTBE	TPH	EDB	Pb	TOTAL NAPHTHALENES
MW-1	BDL	6.0	2.6	6.4	15.0	BDL	BDL	BDL	BDL	BDL
MW-2	BDL	1.3	BDL	3.5	4.8	BDL	BDL	BDL	BDL	BDL
MW-3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW-4	BDL	3.0	2.1	14.0	19.1	BDL	BDL	BDL	BDL	8.4
GMW-13A	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

NOTES: All results reported in parts per billion.
Total BTEX = Summation of benzene, toluene, ethyl benzene, and total xylenes
MTBE = Methyl tert-butyl ether
TPH = Total Petroleum Hydrocarbons
EDB = Ethylene dibromide
Pb = Total lead
Total Naphthalenes = Summation of naphthalene, 1, methylnaphthalene, and 2, methylnaphthalene
BDL = Below detection limits
GMW = Geraghty and Miller well

Sample Date = December 17, 1992

Appendix D

[Other] Sites Potentially Impacting NAS Pensacola Wetlands

Table D-1

Rationale for Sites Identified As Potentially Impacting NAS Pensacola Wetlands

Site	Site Name	Rationale
7	Firefighting School Training Area	• Over 800 feet to nearest wetland and/or surface water body (drainage ditch leading to Bayou Grande). • Flat topography. • No surface pathway identified. • Due to absence of substantial soil/groundwater contamination and distance to nearest surface water, a low probability of significant impact by groundwater pathway exists.
8	Rifle Range Disposal Area	• Over 1,800 feet to nearest wetland and/or surface water body (Golf Course Pond). • Flat topography. • No surface pathway identified. • Soil/groundwater contamination status unknown, but a low probability of substantial impact exists due to age/type of source area.
22	Refueler Repair Shop	• Over 1,800 feet to nearest wetland and/or surface water body (Golf Course Pond). • Flat topography. • No surface pathway identified. • Soil/groundwater contamination status unknown, but only petroleum suspected. Due to age of release (1958-1977) and distance to nearest wetland and/or surface water, a low probability of significant impact by groundwater pathway exists.

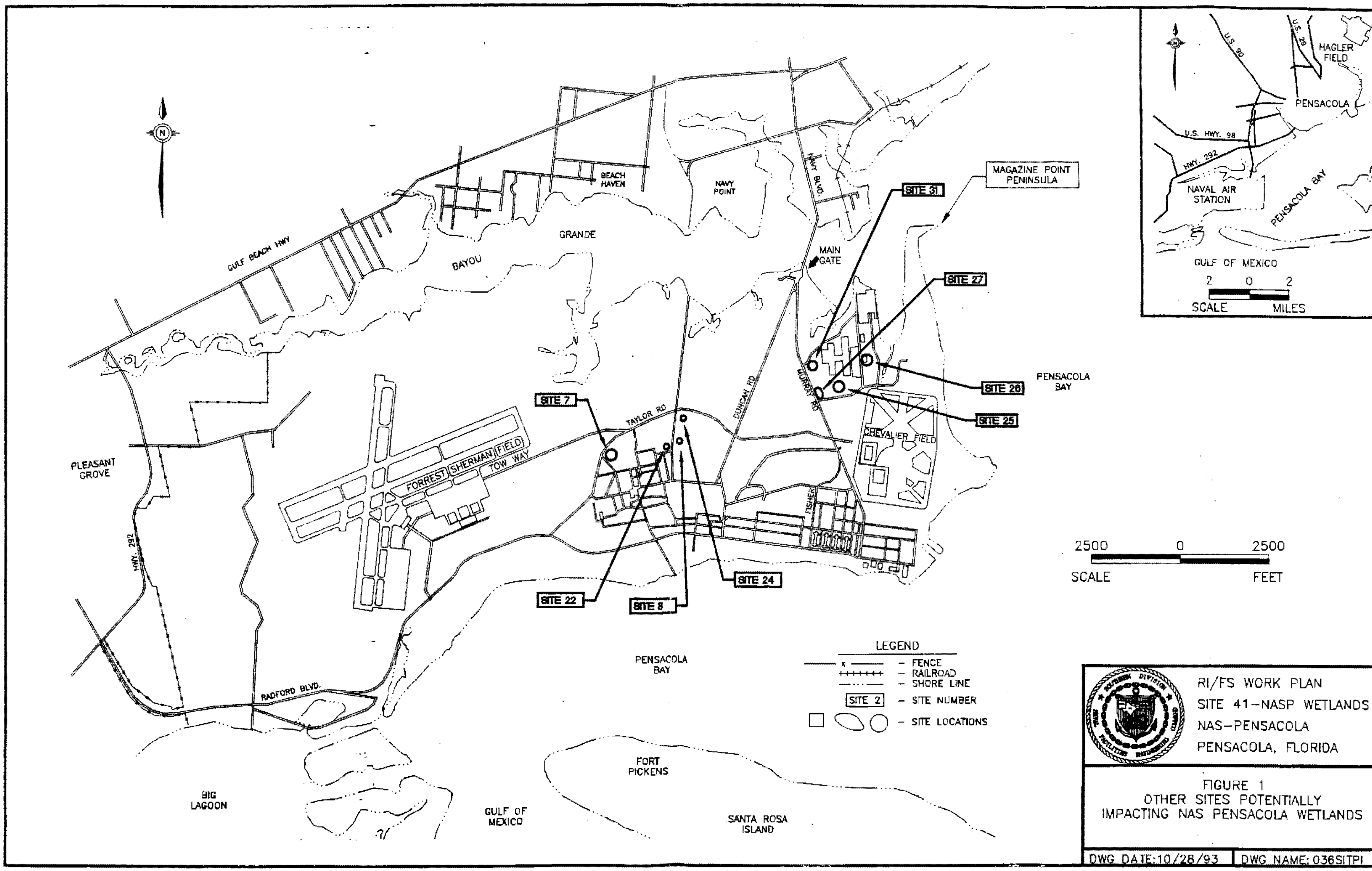
Table D-1 Rationale for Sites Identified As Potentially Impacting NAS Pensacola Wetlands		
Site	**Site Name**	**Rationale**
24	DDT Mixing Area	• Over 1,300 feet to nearest wetland and/or surface water body (Golf Course Pond). • Flat topography. • No surface pathway identified. • Moderate levels of soil/groundwater contamination detected. • Due to distance to nearest wetland and/or surface water, a low probability of significant impact by groundwater pathway exists.
25	Radium Spill Area	• Over 800 feet to nearest wetland and/or surface water body (drainage ditch leading to Bayou Grande). • Flat topography. • No surface pathway identified. • Low to moderate levels of soul/groundwater contaminants detected; however, due to distance to nearest wetland and/or surface water body, a low probability of significant impact by groundwater pathway exists.
26	Supply Department Outside Storage Area	• Over 600 feet to nearest wetland and/or surface water body (Bayou Grande). • No surface pathway identified. • Due to absence of substantial soil/groundwater contamination and distance to nearest wetland and/or surface water, a low probability of significant impact by the groundwater pathway exists.

Table D-1

Rationale for Sites Identified As Potentially Impacting NAS Pensacola Wetlands

Site	Site Name	Rationale
27	Radium Dial Shop Sewer	• Over 900 feet to nearest wetland and/or surface water body (drainage ditch leading to Bayou Grande). • Flat topography. • No surface pathway identified. • Moderate levels of soil/groundwater contaminants detected; however, due to distance to nearest surface water, a low probability of significant impact by groundwater pathway exists.
31	Soil North of Building 648	• Over 800 feet to nearest wetland and/or surface water body (stream/drainage ditch leading to Bayou Grande). • Flat topography. • No surface pathway identified. • Due to absence of substantial soil/groundwater contamination and distance to nearest wetland and/or surface water, a low probability of significant impact by groundwater pathway exists.

Source: Ecology and Environment, Inc., 1992a.



RI/FS WORK PLAN
SITE 41–NASP WETLANDS
NAS–PENSACOLA
PENSACOLA, FLORIDA

FIGURE 1
OTHER SITES POTENTIALLY IMPACTING NAS PENSACOLA WETLANDS

DWG DATE: 10/28/93 | DWG NAME: 036SITPI